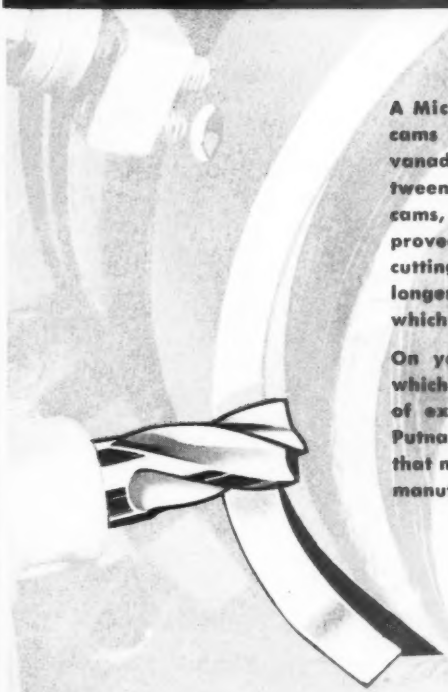
The TOOL & DIE Journal
Tool-Die-Machine PROGRESS

UARY
42

rulation
re than
7,000

SMOOTH, FAST MILLING OF
S.A.E. 6145 Chrome Vanadium Steel

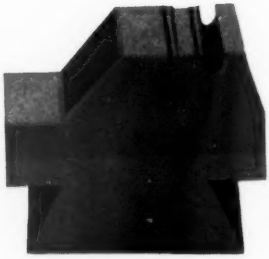


A Michigan manufacturer produces cams made of S. A. E. 6145 chrome vanadium steel which Rockwells between 38 and 42. In milling these cams, Putnam Hi-Speed End Mills have proved to have done a faster job of cutting and have had a considerably longer service life than any others which have been tried.

On your toughest jobs—or on those which are not unusual—you can be sure of excellent results when you select Putnam End Mills. It is for that reason that many of the country's best known manufacturers use them exclusively.

PUTNAM *Hi-Speed* END MILLS
PUTNAM TOOL CO. • 2985 Charlevoix Ave. • Detroit

CONSERVE HIGH SPEED STEEL THIS NEW WAY



Dovetail forming cutters made from FCC Electrically Welded Composite Steel Blanks ***(high speed steel cutting face; mild steel base)*** **save at least 50% of high speed steel. Besides, they offer other distinct advantages. Obvious among them are:—**

1. **Non-hardenable, tough base minimizes tendency to crack and break out at sharp dovetail corners and screw holes during heat treating or when working.**

2. **Easier to drill and tap screw holes and machine dovetails in mild steel base; this work may be done** *after* **hardening if desired.**

3. **More prompt delivery because of reduced amount of high speed steel.**

4. **Inseparable bond between cutting face and base assured by special technique of electric welding.**

5. ***Marked saving of strategically important tungsten.***

Special Bulletin contains full particulars and prices.
Write for your copy of Bulletin TA today.

QUALITY FCC SERVICE

THE FORGING and CASTING CORPORATION

FERNDALE (DETROIT) MICHIGAN

Horizontal-Vertical Fixture with Sub-Base and Tailstock for PRODUCTION WORK.

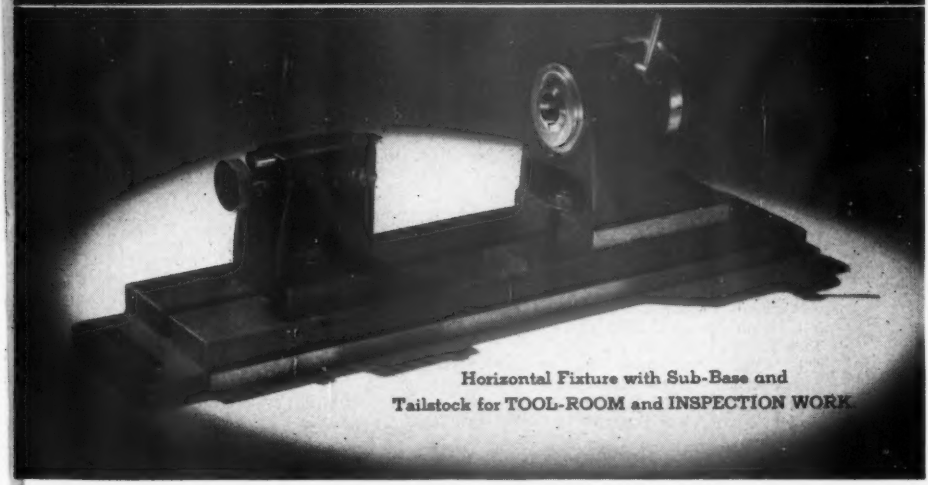
HARDINGE *Collet Index Fixtures*

When you use HARDINGE Collet Index Fixture units you will get more production from your old or new Milling Machines, Grinders, Shapers and Drill Presses. The 1" collet capacity, 20 or 24 hole index plate and 4" center height has a definite application to your second operation and inspection work. The index plate of the Horizontal-Vertical Collet Index Fixture has an arrangement whereby all holes may be "blinded out" except those required for a particular job—this eliminates indexing errors.

Either fixture can be used individually, with the Tailstock, or with the Sub-Base as illustrated.

Ask for bulletin which describes many other features of these Hardinge Collet Index Fixtures.

HARDINGE BROTHERS, Inc. · · ELMIRA, N. Y.



Horizontal Fixture with Sub-Base and Tailstock for TOOL-ROOM and INSPECTION WORK.

The TOOL & DIE Journal

Editor
GEORGE J. HUEBNER

Assistant Editor
PAUL L. REED

▼

Publisher
GEORGE J. HUEBNER

Assistant to Publisher
DON E. ROOT

Director of Circulation
CHARLES H. HAYNES

▼

Advertising Offices

Michigan
R. F. PICKRELL
4273 Tyler Ave., Detroit, Mich.
HOgarth 7603

Mid-Western
L. B. HAMMOND
123 W. Madison St., Chicago, Ill.
RANdolph 1843

Metropolitan New York
MACFARLAND & HEATON
289 Fourth Ave., New York, N.Y.
GRamercy 5-2380

Contents

Vol. VII, No. 10 JANUARY, 1942

Typical Designs for Drilling Jigs and Fixtures —*C. W. Hinman* 29

The Use of X-Rays for the Non-Destructive Inspection of Metals—*R. T. Foreman*.... 32

Letter from Washington—*George J. Huebner* 46

The Design and Layout of Progressive Dies—*Ernest Mehwald* 47

Progress on Parade 66, 67

Additional DCD Offices 68, 69

Metal Duplicating without Dies by New "DI-ACRO" System 70

Recent Industry Publications 72, 74

War Production Association Clearance by DCD Offices 75

Buy With Confidence 81–88

Contract Shops 94–96

Advertisers Index 100

Copyright 1942 by George J. Huebner

Published monthly for key men responsible for designing, building and using Precision Tooling. The TOOL & DIE Journal is the official publication of The Tool & Die Institute. Controlled circulation covering certified operating executives, department heads and key men—CBI Coverage; others including Schools, Libraries and Students $1.50; Foreign $2.00; Single current copies 15c; Other available issues 20c. Advertising, Editorial and Circulation offices at 2460 Fairmount Boulevard, Cleveland, Ohio. Telephone YEllowstone 4040.

SERVING THE NATIONAL DEFENSE PROGRAM

Specialized

PRODUCTION MEANS *Faster* PRODUCTION

Equipment in the plants of Ohio Tool for the manufacture of tools and gages on a production basis is the most modern obtainable.

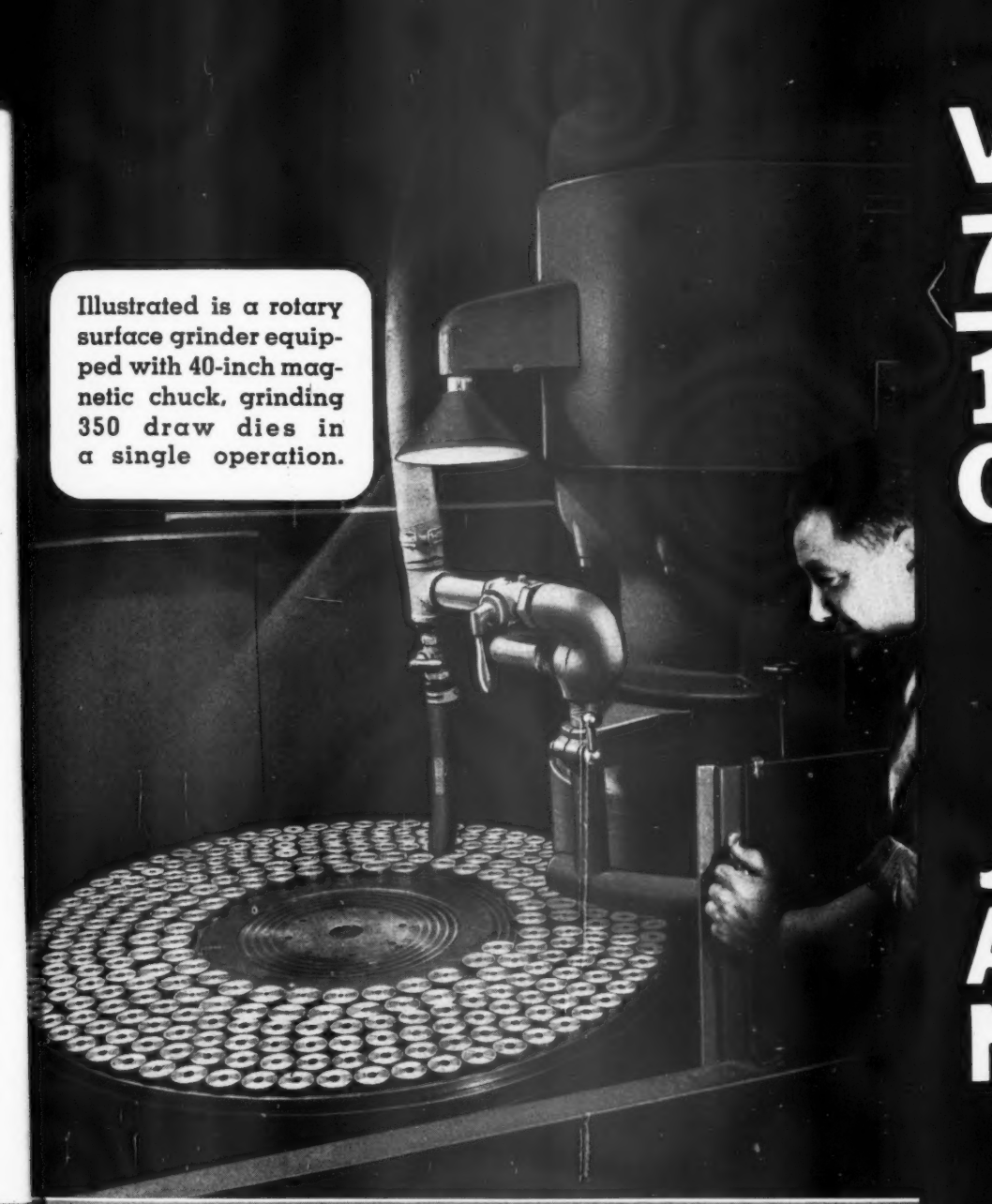
Specialized machinery, coupled with specialized manufacture, enable us to maintain high-speed output of small arms ammunition tools.

★ **OHIO TOOL COMPANY**

Main office and plant: 3160 W. 106th St

Designers and builders of tools • dies • j

LARGEST MANUFACTURER OF S



Illustrated is a rotary surface grinder equipped with 40-inch magnetic chuck, grinding 350 draw dies in a single operation.

CLEVELAND, OHIO ★

Plant No. 2: 7960 Lorain Avenue

fixtures • gages and special machinery

ALL ARMS AMMUNITION TOOLS

It's No Time To Gamble *with Your Cutting Tools*

Grind for Maximum Tool Life!

Use the Norton "B-E" Bond Wheel for High Speed Steels and Stellite

YOU can't afford to take chances today on tool grinding—every minute of useful life from every tool is *absolutely essential*. And now the grinding must often be done with help that is not too expert, thus creating another problem.

Selecting the grinding wheel need not be a gamble, however. For sharpening cutting tools of high speed steel and the cast alloys such as Stellite, the outstandingly popular wheel is the Norton "B-E" bond—as near foolproof as a wheel can be made for this type of work.

Patented "B-E" bond gives a wheel of exceptional strength and exceptional uniformity. It holds its shape and has a crisp, cool grinding action. It gives the tools a keen, long-lasting edge free from burn.

Its type of construction was developed by Norton research to eliminate the gamble, to reduce the risk of damage in tool sharpening—*and it does just that.*

Call on Norton engineering service for help in making the proper selections for your jobs.

NORTON CO., WORCESTER, MASS.

NORTON ABRASIVES

W-B

A *Phantom Gear*

IN EVERY MONARCH LATHE

PRODUCTION BATTLES, in wartime or peacetime, are not won by factories or machines, alone. They're won by morale, by the courage and spirit and willingness of workers and management to put their heads and their hearts, as well as their hands, to this job of getting things done.

That spirit has always prevailed, here at Monarch. Being machine-minded we express it in a production phrase, "*The Phantom Gear.*" Naturally, you won't *see* it in a Monarch lathe. But you'll *feel* its driving power, from improved design to critical inspection of every lathe we build . . . one every working hour, day and night.

This force which we call "*The Phantom Gear*" has been the inner urge of Monarch for more than 30 years. It stimulated our many pioneering improvements which have so broadened the scope of lathe work. Its power will continue as long as there's a Monarch, first by working for VICTORY for our Nation—and after that, helping the thousands of owners and operators of Monarch lathes produce more goods for more people, at lower cost. The Monarch Machine Tool Company, Sidney, Ohio.

MONARCH LATHES

COVER THE TURNING FIELD

How ★ Atlas SERVES THE NATION

REVERE RIDES AGAIN!

"Keep 'em flying — keep 'em firing!" Once again that famous name "Revere" plays an important part in an America at war. This time it's a modern, behind-the-lines role as Revere Copper and Brass Incorporated piles out the shell parts for Uncle Sam. The accurate rotating bands that guide the shells are among the important shell parts made by Revere.

Photo by U. S. Army Signal Corps

In Revere's Rome, N.Y. tool room, the Atlas Shaper makes snap gauges, small tools, and commutator dies.

With America at war, our vital problem is complete efficiency for top production. Use Atlas tools for small precision parts — keep larger machines on the operations they can handle best.

ATLAS PRESS COMPANY

112 N. PITCHER ST., KALAMAZOO, MICH.

LATHES • DRILL PRESSES • ARBOR PRESSES • SHAPERS • MILLING MACHINES

. . . GET INTO TODAY'S PICTURE!

PRECISION GRINDING of threads—either from the hardened solid material or on pre-cut threaded work after heat treat—is in fast increasing demand. The speedy production and repeated accuracy that precision thread grinding assures are becoming absolute requirements in the machining of many metal parts urgently needed today for war purposes.

Eight standard styles of precision thread grinders are made by Ex-Cell-O Corporation, original designers and manufacturers in the United States of precision thread grinders for commercial use.

EX-CELL-O CORPORATION • DETROIT, MICH.

XLO

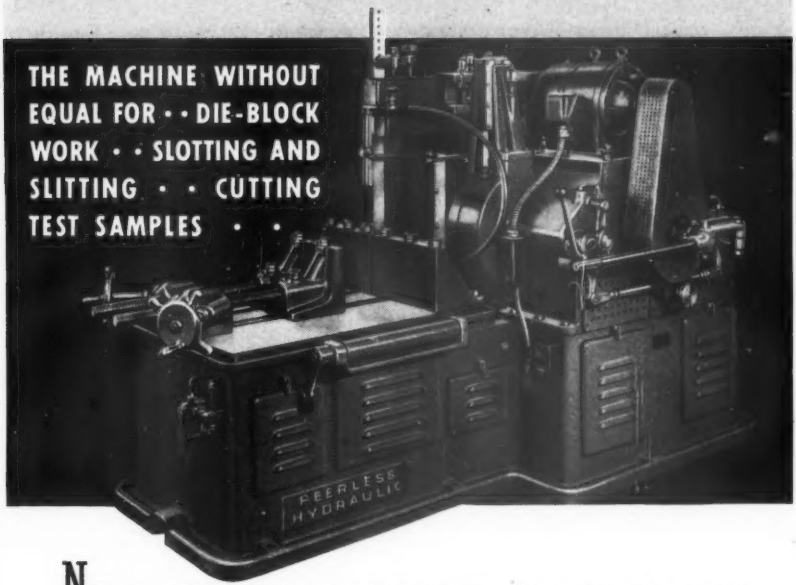
EX-CELL-O *means* PRECISION

MANUFACTURERS OF **PRECISION MACHINE TOOLS**

3 Great Tools
FOR DEFENSE PRODUCTION
DURO
DRILL ★ PRESSES
Duro slow speed—high speed—table models—floor models—single spindle—two spindle—four spindle drill presses are available.
Here are presses that have stability. Presses on which you can depend. Presses whose performance is notable.
Careful machining of superior materials, correct balancing, the use of four ball bearing spindle support, rigid construction, careful assembly, detail inspection, assures you long, satisfactory drill press performance.
Get the facts.
DURO METAL PRODUCTS CO.
Dept. TP-13 2649 N. Kildare Avenue
CHICAGO, ILLINOIS
For DURABILITY use DUROBILT★TOOLS

PEERLESS *HEAVY DUTY* VERTICAL SAW

THE MACHINE WITHOUT EQUAL FOR · · DIE-BLOCK WORK · · SLOTTING AND SLITTING · · CUTTING TEST SAMPLES · ·



NOT only is this Peerless in a class by itself because of its vertical cutting, but it is also unusual because of its smooth, accurate, hydraulic control. Feed, lift on the non-cutting stroke, and the rapid blade return are operated hydraulically.

The Peerless Heavy Duty Vertical is preferred by leading tool and die manufacturers for cutting test samples from huge billets. It cuts out slabs of tool stock as long as 24 inches and any thickness up to 10 inches without turning the work. For reshaping worn blocks, and for slotting and slitting operations in odd shaped structures the Peerless Vertical-Hydraulic is in a class by itself.

None of the precious metal is wasted when stock is cut by this Peerless Vertical which makes the first and only cut to tolerances of thousandths. Even the sawdust is easily salvaged from the convenient chip tray.

Use the coupon for complete information

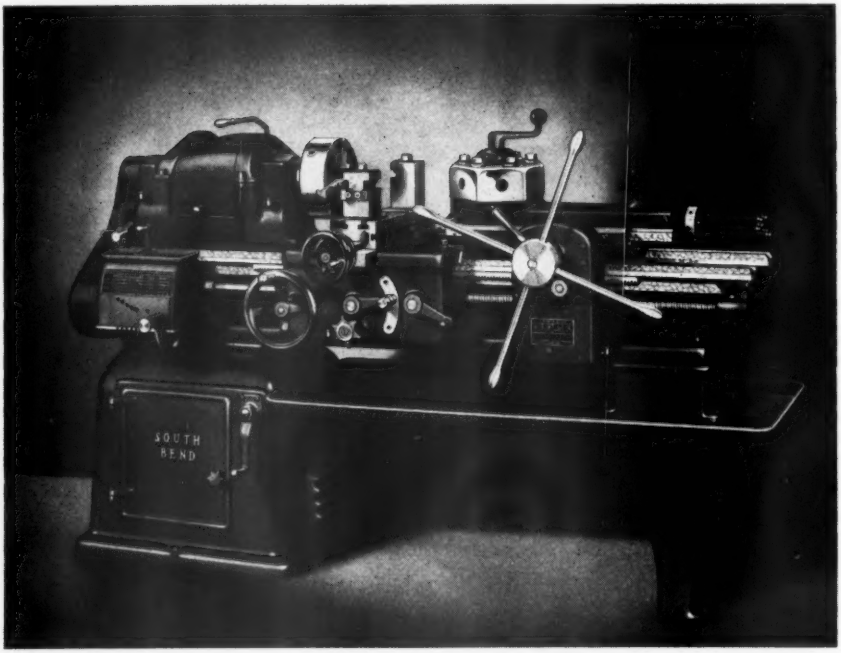
PEERLESS MACHINE COMPANY • Racine, Wisconsin

Peerless
METAL SAWING MACHINES

PEERLESS MACHINE COMPANY
Dept. TDJ-142, Racine, Wisconsin
Mail catalog on Peerless Heavy Duty Vertical.

Company.....
Individual.....
Street.....
City.....State.....

FAST, ACCURATE CUTTING DEMANDS POSITIVE BLADE CONTROL



SOUTH BEND TURRET LATHES

For Efficient Production of Duplicate Parts

THE No. 2H South Bend Turret Lathe is a dependable tool for the efficient production of duplicate parts. It has the precision for exacting, close-tolerance operations, ample power, and the rigidity for producing a fine finish.

Twelve spindle speeds, ranging from 16 to 880 R.P.M. are available. A two-speed motor with convenient lever control permits quick change from high to low speed for reaming and tapping operations. Smooth operation for precision turning and boring operations at high speed is achieved by direct belt drive to the spindle. Slow speeds for heavy cuts on large diameters are driven through back gears.

Bar work up to 1″ round may be passed through the collet. The spindle hole has a capacity for stock up to 1⅜″ in diameter when a universal chuck is used. Maximum capacity for chucking operations is 6⅞″ swing over the tool post saddle cross slide and 16¼″ swing over the bed ways.

The ram-type turret has power feed and hand feed, with individual adjustable feed trip and stop for each of the six turret faces. The turret head indexes automatically on the return stroke of the turret slide.

The tool post carriage has power cross feeds and power longitudinal feeds, also lead screw and splitnut feeds for cutting accurate screw threads. Plain cross slide fitted with front and back tool posts is standard equipment. A 4-way turret tool post can be supplied to order. Write for a catalog and the name of our dealer located nearest you.

SOUTH BEND LATHE WORKS

493 E. Madison St., South Bend, Ind., U. S. A. *Lathe Builders for 35 Years*

★ There's a very good reason why OPM restrictions on high-tungsten tool steels needn't bother you a particle. It's DBL High Speed Steel—an exclusive low-tungsten development of our research which was perfected several years ago, especially with the strategic replacement of "18-4-1" in mind.

DBL is *one* tungsten "moly-type" High Speed Steel that slips into the place of 18-4-1 without a single hitch. You have nothing new to buy or to learn, because it heat-treats in the same equipment and by the same methods as 18-4-1. And you won't fall back a step in the production pace, because DBL performs as well or better than 18-4-1 in 85-90% of all cases.

Our Mill Service Staff is at your service in changing over to DBL or other A-L "moly-type" steels.

Mail the coupon below for the DBL "Blue Sheet," which contains complete technical data.

ALLEGHENY LUDLUM
STEEL CORPORATION — PITTSBURGH, PA.
Tool Steel Division — *Watervliet, N.Y.*

Allegheny Ludlum Steel Corp. T-106
Oliver Building, Pittsburgh, Pa.
Send me a copy of "DBL Blue Sheet."
Name.....
Company.....
Address.....

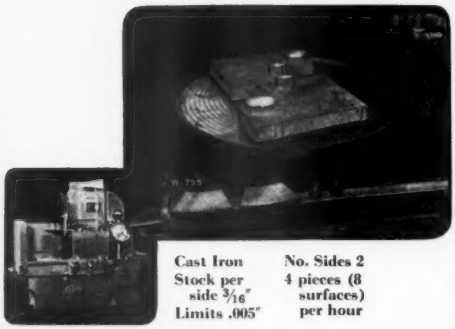
"PUT IT ON THE BLANCHARD"

BLANCHARD

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- Production
- Adaptability
- ★ Fixture Saving
- Operation Saving
- Material Saving
- Fine Finish
- ★ Flatness
- Close Limits

★ . . . . . *Especially valuable on jobs like the one illustrated.*



Cast Iron Stock per side 3/16" Limits .005"

No. Sides 2 4 pieces (8 surfaces) per hour

For Accurate Parallel Surfaces on Projecting Bosses

THESE valve block plates have two projecting bosses. The surfaces of the outer bosses are .500" + .001" lower than the surfaces of the bosses at the center. The outside surfaces are ground first, then the wheel is raised, the chuck is moved in, and the higher surfaces are ground. The plates are then turned over and ground, resting the longer boss on the chuck, the shorter boss on a ½" size block, and the unsupported corner on a small screw jack.

THE BLANCHARD MACHINE COMPANY

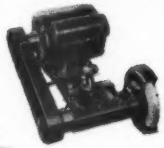
64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

1/16 the thickness of a fly's wing!

YOU CAN GRIND THAT ACCURATELY WITH A DUMORE

A SIZE AND SPEED FOR EVERY NEED



"The Chief", with 1 h.p. motor, is a powerful grinding unit built to tackle the biggest and heaviest work—internal or external. Built for a wider range of work and greater output.

Despite low cost and small size, the "Tom Thumb" is the tool post grinder for small bench and shop lathes, built ruggedly enough for shop work.

Delicately controlled precision . . . to .0001" . . . this is regular, everyday performance with Dumore Grinders. Mounted on a lathe, planer, shaper, milling machine, or other machine tool, a flexible Dumore Grinder cuts costs . . . helps make more profit with your present machinery, and efficiently handles tool room and production grinding jobs, internal or external. Positive *performance* . . . unfailing *accuracy* . . . speed . . . and, above all, *certainty* that Dumore Grinders will deliver peak performance under sustained operating loads . . . these are vital, intangible Dumore features.

A quarter-century of precision grinding research stands back of Dumore Grinders' ability to give steady, better-than-average performance. Honest, experienced craftsmanship—tested selected materials—a manufacturing policy that does not compromise with standards of superiority—all are built into every Dumore Grinder. Call your nearest Dumore Industrial Distributor today, and investigate their possibilities.

THE DUMORE CO. Dept. 372-A RACINE, WIS.

Dumore PRECISION Grinders

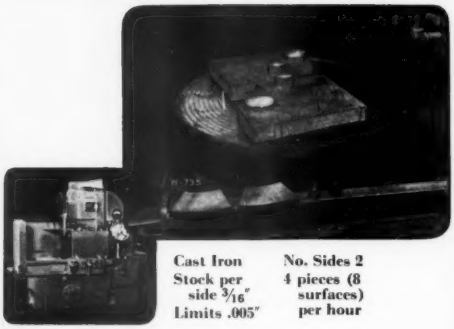
"PUT IT ON THE BLANCHARD"

BLANCHARD

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- Production
- Adaptability
- ★ Fixture Saving
- Operation Saving
- Material Saving
- Fine Finish
- ★ Flatness
- Close Limits

★ . . . . . *Especially valuable on jobs like the one illustrated.*



Cast Iron
Stock per side 3/16"
Limits .005"

No. Sides 2
4 pieces (8 surfaces) per hour

For Accurate Parallel Surfaces on Projecting Bosses

THESE valve block plates have two projecting bosses. The surfaces of the outer bosses are .500" + .001" lower than the surfaces of the bosses at the center. The outside surfaces are ground first, then the wheel is raised, the chuck is moved in, and the higher surfaces are ground. The plates are then turned over and ground, resting the longer boss on the chuck, the shorter boss on a ½" size block, and the unsupported corner on a small screw jack.

THE BLANCHARD MACHINE COMPANY

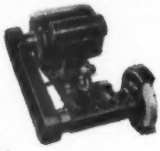
64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

1/16 the thickness of a fly's wing!

YOU CAN GRIND THAT ACCURATELY WITH A DUMORE

A SIZE AND SPEED FOR EVERY NEED



"The Chief", with 1 h.p. motor, is a powerful grinding unit built to tackle the biggest and heaviest work—internal or external. Built for a wider range of work and greater output.

Despite low cost and small size, the "Tom Thumb" is the tool post grinder for small bench and shop lathes, built ruggedly enough for shop work.

Delicately controlled precision . . . to .0001" . . . this is regular, everyday performance with Dumore Grinders. Mounted on a lathe, planer, shaper, milling machine, or other machine tool, a flexible Dumore Grinder cuts costs . . . helps make more profit with your present machinery, and efficiently handles tool room and production grinding jobs, internal or external. Positive *performance* . . . unfailing *accuracy* . . . speed . . . and, above all, *certainty* that Dumore Grinders will deliver peak performance under sustained operating loads . . . these are vital, intangible Dumore features.

A quarter-century of precision grinding research stands back of Dumore Grinders' ability to give steady, better-than-average performance. Honest, experienced craftsmanship—tested selected materials—a manufacturing policy that does not compromise with standards of superiority—all are built into every Dumore Grinder. Call your nearest Dumore Industrial Distributor today, and investigate their possibilities.

THE DUMORE CO. Dept. **372-A RACINE, WIS.**

Dumore PRECISION Grinders

CERRO ALLOYS for Prompt Shipment

CERROMATRIX (Melting Temp., 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, for engraving machine models, stripper plates, chucks, short run forming dies and other metal-working applications.

CERROBASE (Melting Temp., 255° F.) For reproducing master patterns, models for electroforming, engraving machine models, proof casting for forging dies, etc. Perfect reproduction of intricate detail.

CERROBEND (Melting Temp., 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

REPRESENTATIVES AND DISTRIBUTORS

Belmont Smelting & Refining Works, Inc.
330 Belmont Ave., Brooklyn, New York

Machine & Tool Designing Co.
1011 Chestnut Street, Philadelphia Pa.

Die Supply Company
1390 East 30th Street, Cleveland, Ohio

Curtis Industrial Designing Engineers
227 Iron Street Detroit, Michigan

Sterling Products Co., Inc.
121 North Jefferson Street, Chicago, Ill.

Sterling Products Co., Inc.
1524 Third Avenue Moline, Illinois

Harry C. Kettelson, Inc.
329 No. Milwaukee St., Milwaukee, Wis.

Metal Goods Corporation
5239 Brown Avenue St. Louis, Mo.

Metal Goods Corporation
1701 Baltimore Ave., Kansas City, Mo.

Metal Goods Corporation
517 National Mutual Bldg., Tulsa, Okla.

Metal Goods Corporation
413 Canal Bldg. New Orleans, La.

Metal Goods Corporation
2102 Bryan Street Dallas, Texas

Metal Goods Corporation
16 Drennan Street Houston, Texas

Castaloy Die Fixture & Engineering Co.
1855 Industrial St., Los Angeles, Calif.

In Canada: Dominion Merchants Ltd., 180 Vallee Street, Montreal

In England: Mining & Chemical Products Ltd., London

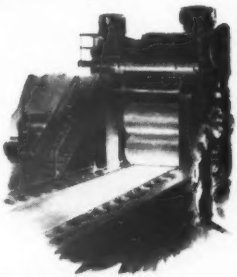
CERRO DE PASCO COPPER CORPORATION

40 WALL STREET - - NEW YORK, N. Y.

What does it take to smooth a Warbird's Feathers ?

A wingspread of 212 feet ...every inch preened sleek as satin! The perfect smoothness of the metal sheathing on American warbirds like the B-19, world's mightiest bomber, isn't there for looks. It's essential to top performance. How do they get the flawless sheets of metal used to make airplanes? They're rolled out by the ton by giant steel rolls. And keeping the surfaces of these rolls ground to almost perfect accuracy and finish is another of the vital contributions of Carborundum-made wheels to America's defense.

Thousands of other products for defense and for normal needs are made by the rolling process. Plate glass for your car, steel rails, plastics, tin plate and paper are only a few. And since their surfaces can be only as perfect as the faces of the rolls that roll them, finish is highly important. Today, surface quality of rolls can be maintained to within a millionth of an inch by the use of Carborundum-made grinding wheels.



The same skill and experience that have helped develop modern roll grinding techniques are at your disposal, too. Whatever your use of grinding wheels or coated abrasives, Carborundum engineers can help you. Send for your copy of "Theory and Practice of Roll Grinding"—Form No. A-786. Write The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
ABRASIVE PRODUCTS
50 YEARS OF SERVICE TO ALL INDUSTRY

Carborundum and Aloxite are registered trade-marks of and indicate manufacture by The Carborundum Company.

DANLY KWIK-KLAMPS

TOGGLE CLAMPS FOR QUICK, POSITIVE CLAMPING IN ANY POSITION WITH

STANDARD HALF TURN

OR STRAIGHT CLAMPING BAR

WRITE YOUR DANLY BRANCH

DANLY MACHINE SPECIALTIES, INC.

2100 So. 52nd Ave. • Chicago, Ill.

Milwaukee, Wis. Dayton, Ohio Rochester, N. Y.
Long Island City, N. Y. Detroit, Mich. Cleveland, Ohio
Philadelphia, Penna.

Ducommun Metals & Supply Company, Los Angeles; San Francisco

DANLY DIE SETS and DIE MAKERS' SUPPLIES

Cut Down Rejections with

MASONITE DIE STOCK

• Masonite Die Stock used as assembly fixture and drill jig for leading edge of airplane wings manufactured at the Vought-Sikorsky Aircraft Division, United Aircraft Corporation, Stratford, Connecticut.

MORE SPEED—less weight—reduced cost—few rejections!

Assembly fixtures are being produced in a fraction of the time formerly required by using the new and improved Masonite Die Stock. The speed with which it may be worked plus its comparative light weight and high strength are some of the reasons the aircraft builders specify Die Stock for this purpose. Drill bushings may be inserted to combine assembly and drilling in same operation.

Masonite Die Stock is only about one-sixth the weight of steel . . . is easily produced in the pattern shop with high-speed wood-working tools. *This semi-plastic material eliminates the scratching of aluminum alloys, thereby cutting down on rejections.*

Dies made of Masonite Die Stock are also being welcomed into many other industries that work with thin gauges of stainless steel and aluminum or magnesium alloys, in sheet form.

Masonite Die Stock is available in thicknesses of ¼ to 2 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. For further particulars, just fill out coupon.

COPYRIGHT 1942, MASONITE CORPORATION

It's Right MASONITE **MASONITE CORPORATION**

Dept. TD-1, 111 W. Washington St., Chicago, Ill.

Please send me illustrative literature and complete information about Masonite Die Stock.

*Name and firm*_____

*Address*_____

*City*_____ *State*_____

"Seeing a Job Through—"

A shop that is equipped—as we are—to see a job through from drawing to finished part, assembly or machine—is, like an individual, skilled, conscientious craftsman, able to get the job done most efficiently.

From our Engineering Department to our final inspection, our facilities in equipment and manpower, have been built to render exacting precision service.

For years we have kept modernizing our equipment systematically.* We are able to meet many unusual demands that are now being made on contract shops.

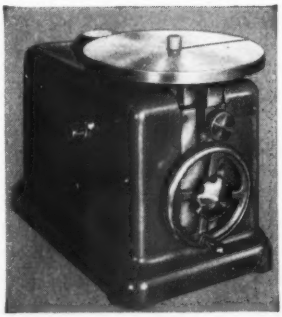
**Send for circular listing our shop machines.*

THE BUNELL MACHINE & TOOL COMPANY

1620 East 24th Street — PRospect 2681 — Cleveland, Ohio

ENGINEERING DEPARTMENT — 23rd and Payne Ave.

Now Production must be Geared for BATTLE!



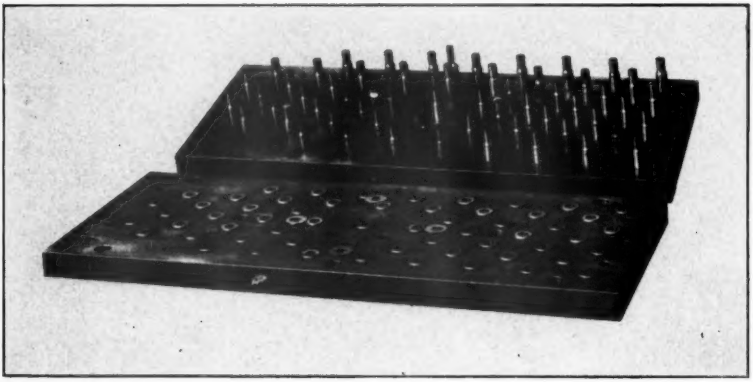
The Fighting Man at the front MUST be served and it takes many men and many hours to keep him supplied and equipped to do the difficult job we demand of him.

A Boyar-Schultz Profile Grinder may be just the machine you need for solving a problem in your tool room or in your production system.

Write for Circulars fully Describing our Profile Grinders

BOYAR-SCHULTZ CORPORATION
2112 WALNUT ST. CHICAGO, ILL.

Meet Stepped-up Requirements of Precision Production



With the HOVIS *Screwlock* Standardized Retainers, Interchangeable Punches and Button Dies. Users of HOVIS products appreciate the advantages of fast, accurate, economical assembly and production.

Complete assemblies are made to order. Screwlocks, Punches and Button Dies are supplied for you or for your contract die builder to install.

HOVIS *Screwlock* Group Plate (illustrated) for retaining interchangeable punches and its corresponding button die plate assures positive lock of every punch; instant removal of every punch; immediate replacement of every punch and accurate operation of all punches.

Lower your die cost—specify HOVIS *Screwlock* Standardized Die Parts.

HOVIS SCREWLOCK COMPANY

8100 E. Nine Mile Road Van Dyke, Mich. (Suburb of Detroit)

Let's talk Shop..

ABOUT YOUR DIE PROBLEMS

JESSOP 3C
High Carbon-High Chrome Die Steel for Increased Die Production

To get the required increase in production from your metal forming and stamping dies resulting from the present emergency, you can do one of two things:

1. Make more dies by purchasing more die steel, hiring more die makers, and installing additional die making equipment—a costly and time-consuming method due to scarcity of men, materials, and equipment.

2. Or you can specify Jessop 3C High Carbon-High Chrome Die Steel and get more pieces per die grind and more grinds per die—an immediate and effective solution to your problem.

Because of high wear resistance, dies made from Jessop 3C High Carbon-High Chrome Die Steel are capable of phenomenally high runs before stoning is necessary. This results in far less press shutdown time and in longer die life—both factors being important to production speed-up. Furthermore, 3C is an oil hardening steel that can be heat treated with greater safety—lessening the risk of spoiling tools and dies by inexperienced men.

Complete information on Jessop 3C Die Steel is contained in Bulletin 341. Write for your free copy today.

JESSOP STEEL COMPANY
General Offices and Works
WASHINGTON, PENNA., U. S. A.

FINE JESSOP STEELS

JESSOP

JESSOP STEELS FOR AMERICA AND HER ALLIES

CARBON · HIGH SPEED · SPECIAL ALLOY · STAINLESS · COMPOSITE STEELS

Our Victory Program's Exacting Demands are Met By the GRINDRITE

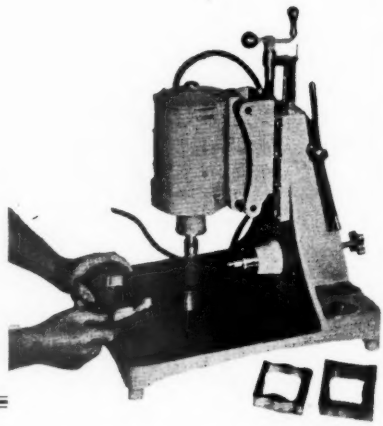
The Grindrite is working for hundreds of shops and departments—performing grinding and filing operations in less than half the time required by tedious hand work.

Unsurpassed as a stock remover and particularly useful for grinding small dies to the line or template, raised edges on punches, and hard-to-work-to surfaces which previously required time consuming, costly set-ups, the Grindrite permits less skilled men to do precision work faster; it frees skilled men for other close limit work.

The Companion Work Bench, equipped with vise and hand tools, is a definite aid in speeding up small or variable production of parts, so important for our Victory Program.

DIE SERVICE

Koestlin die designing and building facilities are serving many important die users. Our experience is at your command. We have our own pattern shop and tryout presses.



KOESTLIN TOOL & DIE CORP.

3601 HUMBOLDT AVE. DETROIT, MICH.

WHEELS OF FORTUNE

CHICAGO MOUNTED WHEELS

NEW CATALOG

Just off the press—the most comprehensive mounted wheel catalog ever published. Shows the complete line of Chicago Mounted Wheels with detailed instructions for their use. *Send for copy today.*

Round and round they go—millions of them — doing every conceivable kind of grinding and polishing job in machine, pattern and die shops, tool rooms, defense plants, foundries, etc.

Designed for rapid, smoother work wherever high-speed portable grinders are used —these superior wheels of V/T Super Bond give 150% to 300% longer service, according to actual tests.

Chicago Mounted Wheels come in a wide variety of shapes, grains, grades and sizes.

TRY ONE FREE

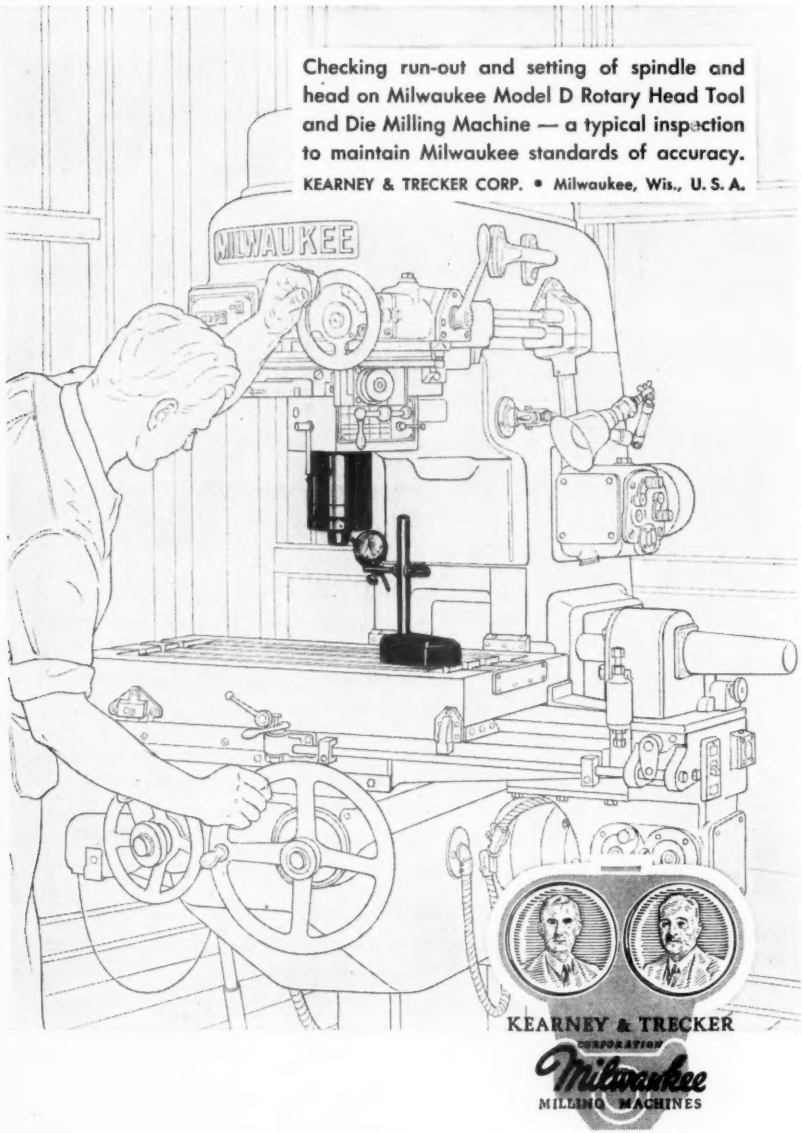
If you've never used Chicago Mounted Wheels, you might like to try a working sample. Write us the style grinder you use and size wheel desired. You'll be amazed at its performance, stamina and the way it holds its shape.

CHICAGO WHEEL & MFG. CO.

Quality Grinders and Wheels for 40 Years

1101 W. Monroe Street Dept. TD Chicago, Ill.

© 1941 C. W. & M. Co.



Checking run-out and setting of spindle and head on Milwaukee Model D Rotary Head Tool and Die Milling Machine — a typical inspection to maintain Milwaukee standards of accuracy.

KEARNEY & TRECKER CORP. • Milwaukee, Wis., U. S. A.

Milwaukee MILLING MACHINES

The TOOL & DIE Journal

JANUARY, 1942 Vol. 7, No. 10

Typical Designs for Drilling Jigs and Fixtures

Part I

By C. W. Hinman
Designing Engineer

This is the first article of a series by C. W. Hinman, well known engineer and author of "Pressworking of Metals" and "Practical Designs for Drilling and Milling Tools." In this and several succeeding articles drilling jig designs will be discussed. Later milling and other types of fixtures will be treated. This series has been prepared in response to requests from a number of our readers.

—The Editor

JIGS for drilling holes in the production of interchangeable parts, as used in mass production, are classified under two general divisions, namely: jigs that are *portable*, or easily turned over from side to side on a standard drilling machine table, and jigs that are *fixed*. The fixed types are positively attached on the drill press table, or are built in as a functional part of a special fixture or drilling machine.

Common types of drilling jigs are: box, box and leaf, channel, angular, vertical stand, rectangular plate, circular plate, cylindrical rotary, and drilling fixtures which are attached as a part of standard or special drilling machines. Accessories include: a *cradle*, which is a notched base or an independent stand for positioning the jig vertically when drilling holes at certain angles to other holes; a *trunnion*, in which rotary jigs are revolved; *channel slides*, used for moving jigs from under one drilling head to another. For large heavy jigs, the channel is provided with rollers to ease the sliding movement. *Indexing Plates*, on which one or more jigs can be attached and revolved into exact positions under the drilling heads also may be considered as accessories. There are several other special devices used for moving, locking, and unlocking large heavy jigs, that may be operated manually, hydraulically, or by compressed air.

All types of jigs may be provided with one or several scores of hardened steel bushings which are press-fitted through the walls of the jig. These bushings guide the drills toward the points in the work where holes are to be drilled. The work is rigidly locked in the jig so tightly that it cannot move in any direction. An especially rigid locking device

must be provided under the work and against the direction of the drilling thrust.

In multiple drilling, each drill in a group may be run at or near the same speed, but the groups themselves may be run at different speeds. Each group may be run at a speed that suits the work material for a certain drill diameter. Therefore, when two or more holes are drilled simultaneously, it is good practice to group together the holes of equal, or nearly equal diameters. This precaution insures that the circumferential travel of the drills, in feet per minute, is approximately the same in each group of drills. This provision is absolutely necessary when the work is of ferrous materials; for, if the speeds are too high, the larger drills will lose their free cutting edges too soon, and must be frequently removed for grinding. When drilling nonferrous materials, this precaution is not so exacting, a larger variation between drill diameters is permissible, but the largest drill in any group must not exceed the given rpm for its size, as given in the speed tables of drills for the material used.

General Precautions in Drill Jig Design

1—Small channel jig bodies, up to about 1½" x 2½" x 8", can be milled from a solid block of machinery steel. Channel jig bodies above this size can be made of cold rolled steel plates and arc welded together, or by designing a wood pattern, the body can be made a cast iron casting. In the latter case, allow stock for machine finishes only where absolutely necessary. Sometimes a forged steel jig body is made, and then machine finished only where necessary.

2—Jig bodies, leaves and fastenings must be strong enough to resist distortion when the clamps are tightened on the work.

3—When work is located for either drilling or milling it should be very securely clamped and supported close to the cutting thrusts.

4—The lengths of guide holes in bushings should be kept under about twice the drill diameter; if the guide hole is excessively long, the drills will heat.

5—The space between the ends of bushings and the work should be equal to or less than the drill diameter, for producing acurate work.

6—For accurate drilling, never locate drill bushings in a movable leaf if it can be avoided, because hinge pins and fastenings will wear, and inaccurate drilling will result. However, in non-precision work, bushings are often located in the leaf.

7—For small jigs with handles and cam locks, the minimum space underneath the handles to the plane of the feet, should be ⅝". This allowance is for finger clearance when picking up the jig.

8—Small jig bodies which are milled from one piece of machinery steel, can be pack case hardened and then straightened in a vise. This process favors long wear, and prevents spot drilling around the bushings. If shouldered bushings are used in soft jig bodies, it tends to avoid the trouble of spot drilling around the bushings.

9—When work is inserted and removed in a box jig, after opening the leaf, the hinge pin in the leaf and the leaf fastenings should be placed far enough away, on either side of the work, to prevent interference with the work piece when loading or unloading the jig. For an ordinary sized jig, used in light manufacturing, this distance is about 1". For larger jigs, this distance should be more.

10—For loading and unloading jigs, feet should be provided to elevate the tool on the side that lies on the drill press table, and especially so if there are fastenings or shouldered bushings to be cleared.

11—When opening the leaf, it should be halted by an angular stop bent at an angle of about 45 degrees. The leaf should be stopped at 45 degrees from a vertical position.

12—Jigs are more easily cleaned if chip clearance holes are provided through their walls, if such holes are possible. For large jigs, such holes also tend to decrease the weight of the tool.

13—All drill jigs should be checked by a toolmaker before using them in production. He must replace, or "shim" worn gages and other parts, and replace worn bushings, hinge pins, cams and latches. A sample should be drilled in every jig repaired, and the sample checked for accuracy.

Typical Box Drill Jig for Drilling from Two Sides

For the cast iron part shown in the drill jig in Fig. 1, eleven holes are to be drilled. Seven holes are drilled through the work, from the body side of the jig, and four are "blind" holes with bottoms, and drilled through bushings in the leaf, as shown. The work is called a "front-plate." It is used on an air compressing cylinder. First of all, the work is machine faced; its center hole is drilled in a turret lathe, and the finished diameter A is an easy clearance fit within tool steel ring B. The ring is hardened, ground and positively attached on the floor of the jig body.

This jig body is of cast iron. It is machine finished only on those surfaces indicated by *f*. Some of the features of the jig are: a leaf stop, a hand screw C, with a thumb and finger pin through its head and a loose clamp washer on its point, a cold rolled steel leaf, and a latch hook that can be ad-

(Continued on Page 62)

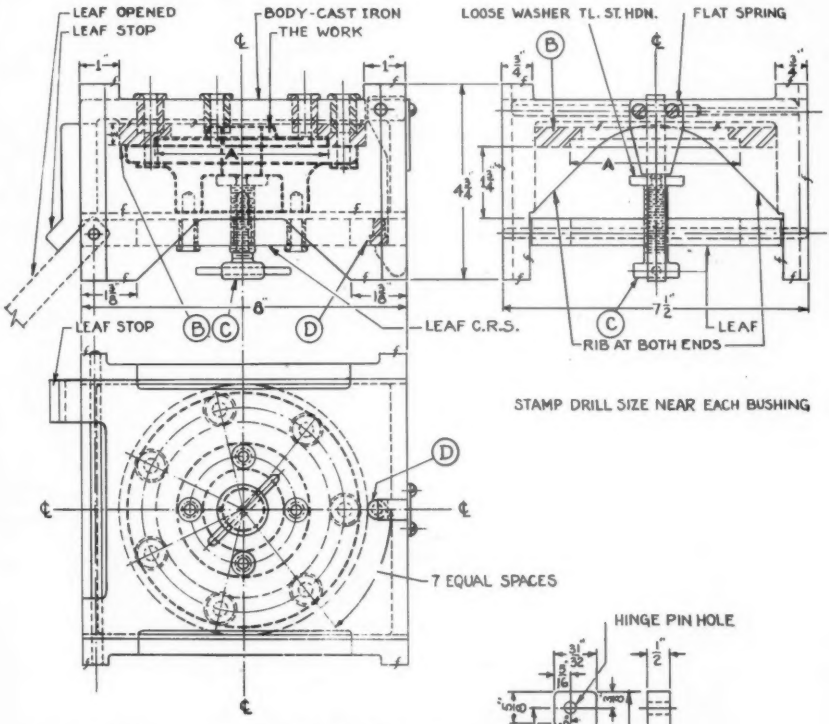


Fig. 1. Top, a cast iron box drill jig for drilling holes from two opposite sides of a piece.

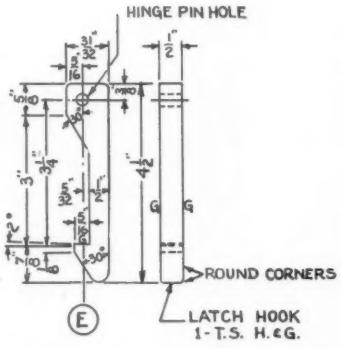


Fig. 2. Right, A latch hook having two special features that prevent loosening its hold under drilling pressure.

A Reader Requested Article

The Use of X-Rays for the Non-Destructive Inspection of Metals

By R. T. Foreman

The Kelley-Koett Mfg. Co., Inc.

WHILE the value of X-rays to detect flaws in castings and forgings and prevent failures of metal in operation has been understood for some years, it has only been in the past few years that X-ray analysis has been used to any extent in the machine tool field. At present there is a very definite tendency to employ X-ray, particularly the diffraction method, to steels, ferrous alloys, aluminum and its alloys and other metals employed for Victory Program work. The diffraction method, because it actually makes it possible to peer into the very composition of matter and visualize the arrangement of molecules, is invaluable in detecting stresses and strains, in checking effects of both cold working and reheating as well as discovering air pockets, slag holes, cracks or other defects in metal.

The early X-ray equipment was very bulky. Exposed high voltage lines were a menace to operators as also was the "stray" X-ray energy emanated from the open tubes. Tremendous strides in design have been made in the last ten years—all high voltage equipment is now immersed in oil in sealed containers—high voltage is carried to the tube

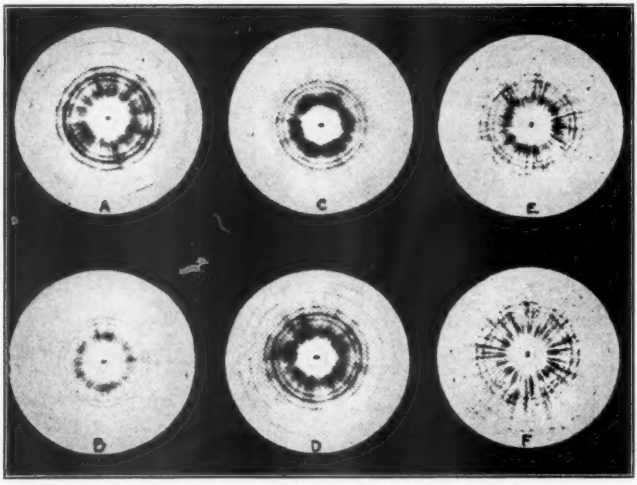


Fig. 1

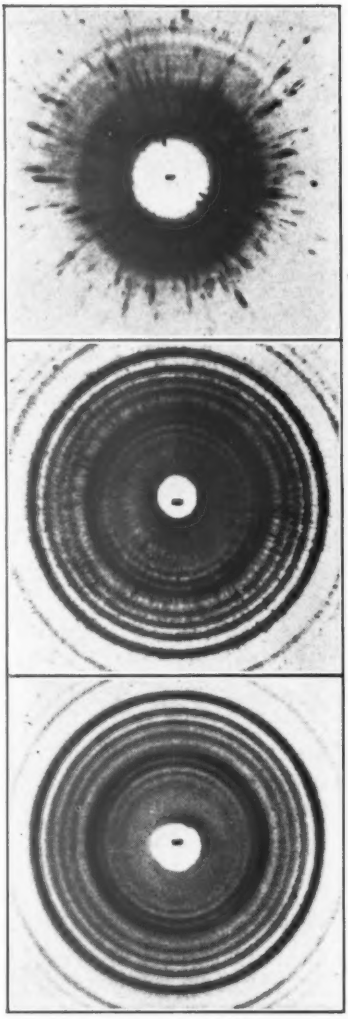
(a) Annealed at 200 C
(b) Annealed at 350 C
(c) Annealed at 450 C
(d) Annealed at 600 C
(e) Annealed at 650 C
(f) Annealed at 700 C

in flexible insulated cables, encased in a metal sheath connected to the ground. X-ray tubes are immersed in oil, greatly reducing the size of their metal container and protecting the operator from high voltage shock.

Operator protection is carried still further by providing lead-lined booths for use while films are being made. The result of these precautions is that workers in X-ray departments enjoy excellent health and suffer no ill consequences if they observe the necessary simple precautions.

Modern X-ray equipment has been simplified and smaller, more compact units have been made portable. A typical X-ray setup for work on small parts is shown. This unit is completely shockproof and gives excellent results in the hands of the average laboratory employee. It consists essentially of a generator and an X-ray tube mounted vertically on the axis of the cylindrical housing. A thin specimen is placed in the path of a pencil beam of X-rays and casts a shadow on the film, which is supported vertically in the special holders mounted on the unit. With the stationary, vertical film, the X-ray beam is reflected at a small angle from the surface of the specimen (or may pass completely through it) to produce shadows on the film which may be readily interpreted on the basis of available data.

An extremely flexible method is also available by using the motor-driven camera shown at the left of the X-ray tube. In this apparatus, a thicker specimen is used; the X-ray beam strikes the face of the specimen and is reflected to the film. This "back-reflection" method is in wide use in studying the effect of cold working of metals. Whenever any material is subjected to rolling or machining processes, the atomic planes undergo bending and distortion. In the normal, unstrained state, the grains reflect X-rays to produce a sharp spot on the film. As strain is increased, distortion occurs, producing reflections in diffuse or elongated spots. This method is very useful in determining the depth to which a metal has been cold worked by machining. The metal is radiographed and then etched away step by step until a point is reached at which further etching produces no increase in sharpness of the shadows. It is thus possible to study the exact depth of cold work due to milling, lathe turning, or surface rolling of shafts.



Figs. 2, 3, 4

Fig. 2, top, shows X-ray diffraction pattern of unannealed steel; Fig. 3, center, of partly annealed steel; and Fig. 4, bottom, of steel completely annealed.

Even larger X-ray units have been made portable. For example, at the

Westinghouse East Pittsburgh, Pa., works, 4,500-pound X-ray cameras are moved along production lines to take inside pictures of metal. These X-ray machines bombard 2,500-pound steel castings and in a very short time a developed photographic plate reveals to engineers whether the inside metal contains defects that may require the scrapping of such parts.

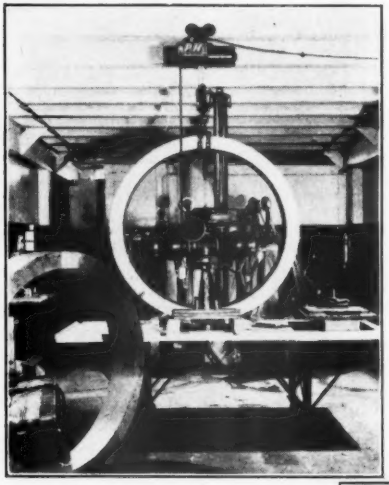


Photo Courtesy: Harnischfeger Corporation

Fig. 5 An X-ray machine examining welds in P&H gear blanks. A Zip-Lift positions the blanks for testing.

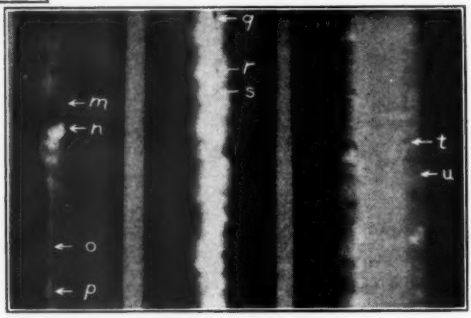


Fig. 6 X-ray photos of three welds, the left and center of which show areas of poor fusion, causes of failure. A satisfactory weld is shown at the right.

Portable X-ray machines consist of an X-ray tube, transformer, condensers and flexible focusing device all compactly mounted on a chassis equipped with four balloon tires, automobile springs and two-wheel mechanical brakes.

X-ray testing or inspection is non-destructive, permitting as it does the examination of small or large portions of surface or interior, and offers an ideal solution of the problems confronting the tool and die industry in its search for faster, more accurate production of high quality metals and alloys. X-ray examination demonstrates defects before expensive machining or fabricating has been done. It is this ability—to detect flaws in raw materials—to save time lost in machining—to point the way to improvements in fabrication—that accounts for the ever-increasing use of X-ray examinations as a means of speeding production for defense.

Diffraction Analysis

The use of the diffraction method of X-ray analysis is of particular importance to the precision metal working industry because it makes possible photographs of molecular patterns. The sample is placed in the path of a narrow pencil of X-ray and the film records the reflection from each molecule, a circular image whose shape depends on molecular arrangement. An example of this sort of analysis is shown in Figure 1*. An annealed monel metal rod was cold drawn from 1⅝" to 1⅛" in two passes. Specimens were reheated at various temperatures and produced the patterns shown. As the reheat temperature was increased, the crystals rearranged themselves until at 600 degrees the first evidence of recrystallization appeared in the form of tiny dots superimposed on the rings. Between 600 and 650 degrees the crystallization proceeded rapidly and produced a striking change in mechanical properties. The yield point shows a 25

(Continued on Page 36)

*Courtesy American Society for Testing Materials. Readers are referred to "Symposium on Radiography and X-ray Diffraction Methods" available from that Society.

STOP ALL THE WASTE OF OLD-TIME METAL CUTTING

★ WASTE OF TIME
★ WASTE OF POWER
★ WASTE OF LABOR
★ WASTE OF ENERGY
★ WASTE OF METAL

DO-ALL Contour Machine
BAND SAWING
BAND FILING
BAND POLISHING

4 CORNERS CUT IN 4 HOURS

With the DoAll a 4½" x 1½" cut was made in each corner of this 18" thick, 945-pound MO-LYB-DIE Hardtem B block. It took only one hour to notch each corner. The saw cut very straight and the job turned out beautifully.

—Lansing Drop Forge Co., Lansing, Mich.

12 HOURS 40 MINUTES SAVED

Four pieces of Water Hardening Tool Steel 2" x 10" x 11" formerly done on shaper in 14 hours, now sawed on the DoAll in 1 hour and 20 minutes.

—Swanson Tool & Machine Co., Erie, Pa.

SAVE WITH THE DoAll

This ultra-modern machine tool offers you the fastest, most efficient way of removing metal, any kind, from the hardest high carbon steel to soft brass. Does internal and external band sawing, filing and polishing. The DoAll cuts corners all along the line—takes the place of shaper, milling and lathe work in industrial and defense plants everywhere.

Let us send a factory trained man to your plant to demonstrate just what a DoAll can save you.

CONTINENTAL MACHINES, INC.

1303 S. Washington Ave., Minneapolis, Minn.
Associated with the DoAll Company, DesPlaines, Ill., Manufacturers of Band Saws and Band Files for DoAll Contour Machines.

FREE—Literature and 158-page Handbook on Contour Machining. Send for copy today.

Use of X-rays for Non-Destructive Inspection of Metals

(Continued from Page 34)

percent drop and the tensile strength an 8 percent drop for this comparatively small increase in reheat temperature. These reproductions illustrate the sensitivity of X-ray analysis as the critical temperature is exceeded.

Another example is shown in Figs. 2, 3, 4. The three diffraction patterns are of one sample of steel respectively, unannealed, partially annealed and completely annealed. This type of X-ray analysis gives a complete, fool-proof check on annealing, determining as it does the correct amount of annealing necessary to eliminate stresses and strains.

A slightly different method—spectral analysis—may also be used. In this analysis the specimen and the X-ray beam are arranged in such a manner that a series of dark bands are obtained on the film. The position of these bands shifts according to the composition of the material and the degree of strain. It is the same sort of analysis, made with X-rays, that permits astronomers to analyze the light from stars and determine their temperature, composition and speed. The uniformity of an alloy —the "solubility" of the metals with respect to each other—can be determined.

Effect of Cold Working

Cold working produces three effects on the grain structure of a metal. In the first place, the grains themselves are distorted, either uniformly or in irregular fashion. If the distortion is uniform, the crystal grains will be elastically deformed, as in the case of pure torsion or pure tension within the elastic limit. If the distortion is not uniform, but varies from point to point, the deformation is irregular in character —a type of strain which results from quenching or from solidification of a melt. These strains are small and are sufficiently elastic to disappear when the deforming force is removed.

When the elastic limit is exceeded, a second effect appears, in which the crystal grains are fragmented by a process of glide upon atomic planes. Such fragmentation arises as a result of external forces or from stresses set up within the material when it cools rapidly.

With still greater amounts of cold working, a third effect appears. In rolling, drawing, or extruding, which is naturally directional in character, the grains arrange themselves according to some special alignment. This effect is often of considerable value, as in forging magnesium alloy airplane propellers, where the special orientation produces blanks from which the finished propeller may be most easily obtained without flaws. For most industrial work, such orientation is not desirable and must be removed by proper treatment after the cold work operations. A single X-ray examination will suffice to show its presence or absence, and steps may be taken to correct the condition causing such orientation.

Effect of Reheating

These three effects may be reversed by reheating a cold worked metal. Just as the deformation depends on the degree of cold working, so are the stresses relieved in like order—the stresses falling within the elastic limit are first relieved, followed by plastic flow and disappearance of the second effect. This "recovery" of a metal may be traced quite accurately by X-ray analysis, the sharpness of the lines increasing as stresses are relieved.

In heating to relieve stresses, care must be taken to stay below the temperature at which recrystallization begins. When this temperature is reached, the grains begin to grow in size, producing tiny spots on the X-ray film which become larger and fewer in number as the grains increase in size. X-ray analysis is a sensitive method of determining the recrystallization temperature, as well as the size, orientation and perfection of the crystal grains.

Metal Working

The formability of sheet metal is of vital importance to those industries producing cartridge and shell cases. The rolling technic has great influence on the crystal orientation and experiments can be conducted to obtain sheets best suited to later forming. In general, the formability increases as the random orientation increases; it is undesirable,

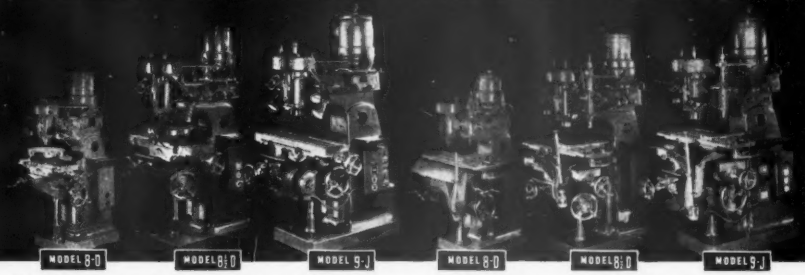
(Continued on Page 38)

MODERN GORTON MACHINES ASSURE FUTURE ECONOMIC SAFETY

Purchase the Modern 1942 Machine Tools—needed for present emergencies—that can later be used to reduce your production costs . . . help you maintain profits in highly competitive markets.

Use George Gorton Specialized Engineering Service to assist you in the selection of the right cost-reducing equipment for die making, engraving and vertical milling. Recommendations without obligation.

Vertical Milling Machines ★ GORTON SUPER-SPEED ★ Duplicating Machines



For Light Production Milling—Tool Work—and Jig Boring

For Duplicating Multiple Dies and Molds from Originals

2 Dimensional ★ PANTOGRAPH ENGRAVING MACHINES ★ 3 Dimensional

For Engraving Letters and Designs from Templates

For Reproducing Intricate Dies from Models

SPECIAL PURPOSE MACHINES AND ACCESSORIES

WRITE FOR FREE CATALOGS giving complete information on **GORTON 1942 Machine Equipment**

No. 1400-A—Super Speed Vertical Milling Machines
No. 1319-C—Die and Mold DUPLICATORS
No. 1580-A—Pantograph ENGRAVING Machines
No. 1317-D—Time-Saving ACCESSORIES, Small Tools

GORTON

GEORGE GORTON MACHINE CO.
1319 RACINE STREET, RACINE, WISCONSIN, U. S. A.

Use of X-rays for Non-Destructive Inspection of Metals

(Continued from Page 36)

therefore, to use any type of rolling or forging which tends to produce special orientation. X-ray analysis not only shows crystal arrangement, but permits determination of crystal size—an exceedingly difficult operation with the microscope because of selective etching.

Tool Steel

High speed steel, particularly that used for milling cutters, end mills or similar tools, must be free of heterogeneous strains which might result in failure in use. X-ray examination of such steels will permit developing a satisfactory aging and tempering process. Only small specimens need be used for each test, prepared under carefully controlled laboratory conditions. When the correct technic has been developed, the laboratory results can be transferred to production, again checking the larger specimens to be certain that no change has occurred.

Castings—Tubing

Figure 7 illustrates an aluminum casting, obviously porous. The casting presented a very smooth exterior surface, but upon inspecting it with X-rays, the Army Air Corps forestalled its failure in service. Such castings could not stand up under the tremendous hammering and vibration to which they are subjected. Failure in time of combat might be the turning point in an engagement—might result in loss of plane and pilot.

Fig. 7

This X-ray of an aluminum casting revealed 6 disqualifying defects, none of which were otherwise visible.

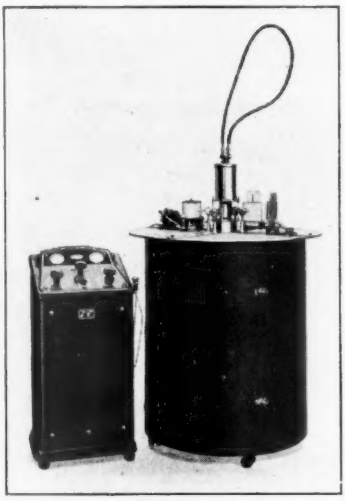


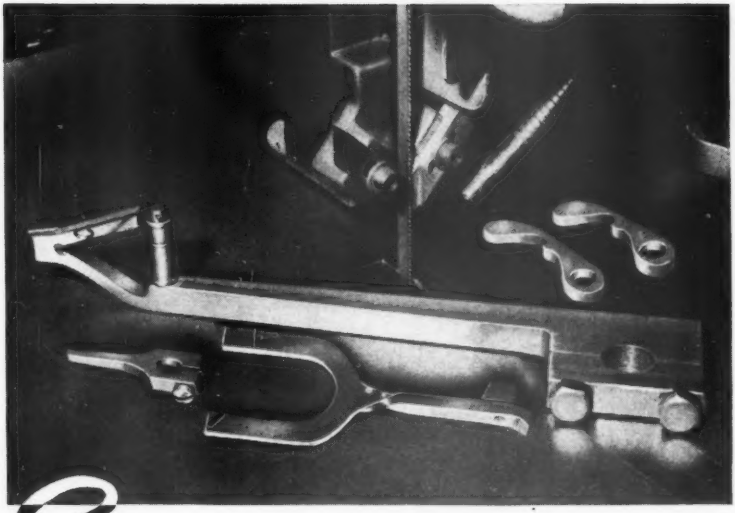
Fig. 8

A typical X-ray apparatus for small parts work. This unit is shockproof and can be operated by average laboratory or inspection department employee.

X-ray equipment is also used at Wright Field by the Army Air Corps to locate points of weakness in internal wing structure and other concealed parts of model planes under test in wind tunnels.

X-ray testing of steel tubing has resulted in noteworthy improvement in quality. In all rolling processes, flaws are likely to occur well below the surface —One manufacturer found that hidden flaws in tubing showed up only after expensive machining had been done. Instituting X-ray analysis, he processed the tubing in various ways until he obtained a sample showing none of the objectionable defects. Thus he avoided the expense of useless machining and rejection of partially finished material.

(Continued on Page 64)

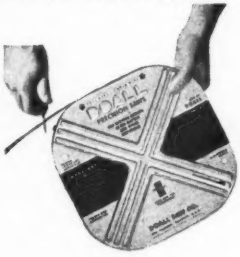


Easy as PIE FOR DoAll SAWS

Yes, Sir, they go right through any kind of metal or alloy with a speed and smoothness that is astonishing.

Above parts, formerly cut by hand, are now sawed on the DoAll without blueprints, for an automatic paper file folding machine at Linder Mfg. Co., Minneapolis. Savings in time are tremendous, according to Mr. Linder.

And, not satisfied with cutting ordinary metals, DoAll Saws do a real job on such tough ones as cold rolled nickel, laminated low carbon sheet steel, Neoprene, aluminum alloy, bronze, semi-steel castings, etc.



Available in various lengths, each saw comes in a patented metal box, with a slot for saw to be pulled out and cut off as required.

42 STANDARD SIZES

DoAll Band Saws come in every size approved by the OPM, in Raker tooth, heavy set, A temper.

FREE BOOKLET—"Actual Performance Records of DoAll Saws." Send for copy. It's short and interesting.

THE DOALL COMPANY

1203 Thacker St. **Des Plaines, Ill.**

Associated with Continental Machines, Inc., Minneapolis, Minn.

DO SAWS ALL

Tuff-Hard Method Reduces Tool Production Costs

THE Tuff-Hard Corporation, Detroit, heat treaters and manufacturers of high speed cutting bits, announces a recently patented process of heat treating tool steels; the new method reduces cost by increasing production through more material removed per revolution, stroke of machine and between grinds.

According to F. A. Endress, president of Tuff-Hard Corporation and developer of the process, the experience of many leading manufacturers and tool shops who have been using Tuff-Hard treated tools has been that the new process enables them to replace Tungsten and Cobalt cutting tools with Tuff-Hard treated tools made of so-called "inferior" substitutes.

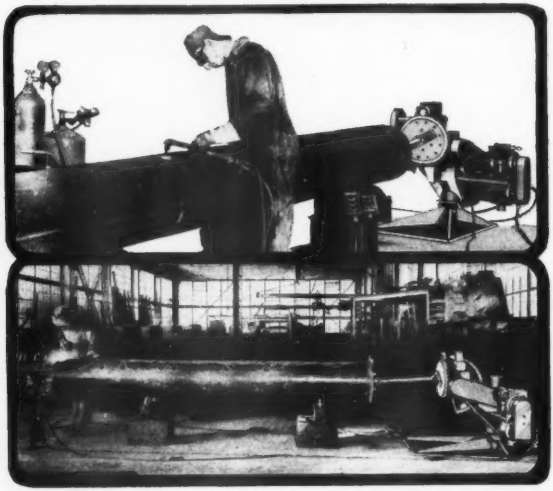
The process is especially applicable to molybdenum high speed steels which are still available in reasonable quantities and which government regulations are compelling tool users to accept. Normal results are claimed for molybdenum tools treated by the new process. They are said to be on a parity with the Tungsten and Cobalt types in cutting properties. By means of the Tuff-Hard process the range of all steels used for standard cutting performance is widened and particularly molybdenum steels come nearer to being all-purpose tools than by any other process.

Due to the tenacious strength of the cutting edge, Tuff-Hard heated tools make possible deeper cuts at fixed speeds or greater feeds with the same cut. Either way it means a saving of time in the removal of more material in a given length of time, says Endress.

The Tuff-Hard process is available in three distinct types of service: (1) as a service for the heat treatment of specially designed tools, particularly high speed molybdenum; (2) in supplying tool bits in various grades and standard square sizes; (3) a patent licensing arrangement, under which manufacturers can heat treat their own tools, or production parts that require an unusual combination of toughness and hardness.

For full information on the Tuff-Hard Method and services, address Tuff-Hard Corp., 5963 Caniff Ave., Detroit, Mich.

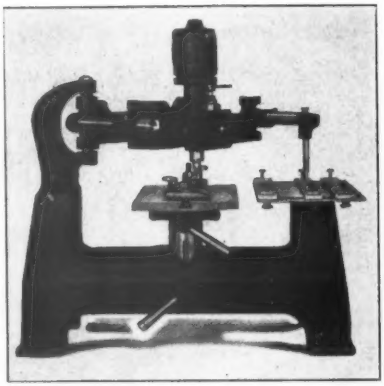
● **Cut your handling costs and increase production in flame-cutting and welding heavy tubular structures.**



● C-F WELDING POSITIONERS will turn your work at controlled speeds for accurate cutting and better "down-hand" welding. As shown above, flexible coupling arm eliminates need of true alignment and the only extra equipment is a set of rollers. Here is just another feature of production economy offered by C-F POSITIONERS. We suggest you send for our Bulletin WP 20 which tells the complete story.

CULLEN-FRIESTEDT CO.
1316 S. KILBOURN AVE. CHICAGO, ILLINOIS

Preis Announces Improved Pantographic Machine



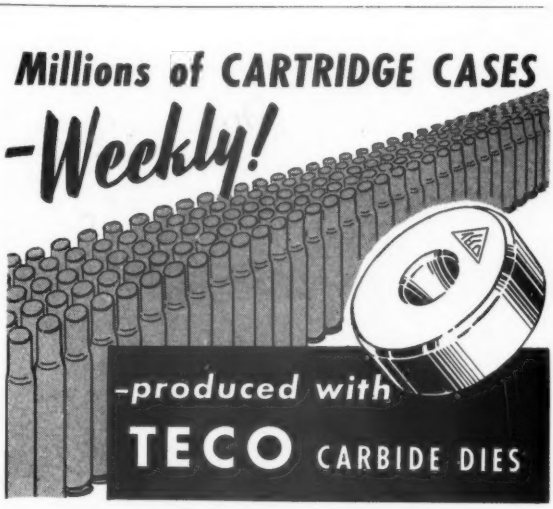
THE H. P. Preis Engraving Machine Co., Newark, N. J., has announced an improved machine of pantographic operation for rotary engraving, electrical marking and acid etching. Separate heads, quickly interchangeable, are used for the three classes of work. Reductions from 1.8 to 1 down to 5 to 1 are provided for.

Depth of cut, independent of the depth of the master characters, is controlled by a micrometer adjustment mechanism on the engraving head. A cam action drop lever controls cutter movement. The cutter spindle, equipped with adjustable ball bearings, is driven by a ball bearing motor.

The electrical marking head is served by a transformer with a ten-stage voltage control switch for selecting any desired degree of marking—from very light to very heavy.

The acid etching head is used for cutting through an acid-resisting coating on metal or glass, in preparation for the application of the acid etch-fluid. This method is widely used in marking gages, tools and machine parts as well as glass tubes, laboratory equipment and optical lenses.

The improved Pantographic Machine, including all attachments, is fully described and illustrated in a new folder which is available at your request. Address H. P. Preis Engraving Machine Co., 155 Summitt St., Newark, N. J.



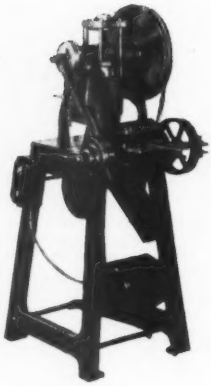
- DRAW DIES
- NECKING DIES
- SIZING DIES
- TAPERING DIES
- BULLET DIES
- SWAGE DIES

The extra capacity of TECO CARBIDE DIES is being strikingly demonstrated by their enormous production of cartridge cases in America's ordnance plants. Working at top speed day and night, TECO Dies are producing phenomenal quantities per die . . . holding all on size . . . eliminating rejects. These are features *every* die user wants and can get by using TECO Carbide Dies.

TUNGSTEN ELECTRIC CORPORATION
570 39th Street • • • Union City, N. J.
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Pioneers in Tungsten Carbides for Over a Quarter Century

TEXTS FOR TECHNICAL TRAINING

The TOOL & DIE Journal maintains a Technical Book Service — we select and recommend books to meet specific training needs. If you have a training problem we will be glad to make recommendations to fit your needs.



Fast Small Stamping Production with Diebel Hi-Speed Presses

THE Diebel Hi-Speed Automatic Press has been developed by the Diebel Die and Manufacturing Co., Chicago, Ill., to meet the demand for a small, but rigidly built, automatic punch press to handle small stampings of metal, plastics, fibre or similar material. Taking up a minimum of floor space, 20" x 32", with an overall height of 54", this compact, sturdily built unit adequately meets this demand.

The Diebel press positively and accurately works at speeds from 180 to 500 strokes per minute and can be engaged or disengaged without stopping the press. Strip punching is almost as easy as handling coil stock. Adjustment of clamping tension on feed rollers is not necessary as stock guides are provided. The 3" diameter hardened feed rollers come either knurled or smooth ground. The maximum die size is 6¼"x8". The press is rated at approximately 4.4 tons.

In addition to the exceptionally high production speed, the press also has shown great savings in die maintenance because of its construction. The 4" ground cylinder ram runs in an adjustable bronze bearing sleeve to assure perfect die lineup. This results in 10 to 30 percent or more blanks per grind.

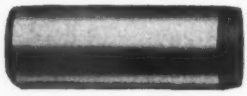
For further information and literature on the Diebel Hi-Speed Press address Diebel Die and Manufacturing Co., Dept TD, 3654 Lincoln Ave., Chicago, Ill.

Immediate Delivery of

SOCKET SCREWS

We carry all standard sizes of Socket Head and Common Screws

Try us first also for Hex Nuts, Dowel Pins, Die Springs (3 complete lines) and other Die Makers' Supplies.



Cerromatrix Cerrobend Cerrobase

Distributors of Hardsteel Drills

Producto Die Sets Layout Fluid

Catalog on Request

DIE SUPPLY COMPANY

J. R. Fitzsimmons W. H. Fitzsimmons Jos. T. Fitzsimmons

Telephone CHerry 6818

1390 East 30th St. Cleveland, O.

Hammond Machinery Adds 10″ Carbide Tool Grinder to Line

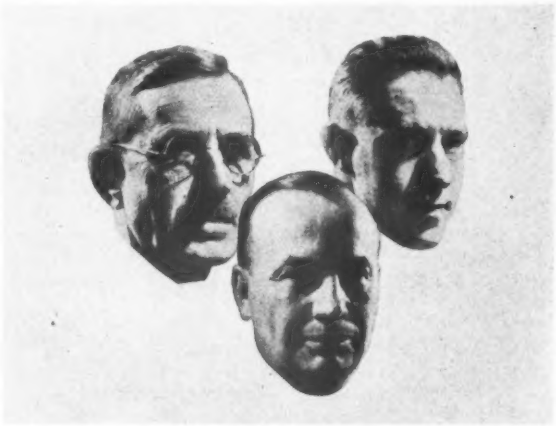
HAMMOND Machinery Builders, Inc., Kalamazoo, Mich., has added to its line of Carbide Tool Grinders the new 10″ Carbide Tool Grinder, which combines facilities for straight wheel peripheral and cup wheel face grinding.

Work tables tilt from 0° to 25°, each degree of tilt accurately measured by a scale mounted below. The tables are slotted to accommodate the protractor angle-guide furnished with the machine and are grooved to keep the working surface free from grit and dirt which might affect accuracy of grinding angles. The table on the right is mounted on a heavy supporting shaft, directly over a casting which serves as a sludge pan. By releasing one simple clamp the entire unit may be removed from the shaft, permitting cleaning of the sludge pan or replacement of wheels.

The right side of the machine can be fitted with a reservoir mounted directly over the wheel on the cast iron guard for wet grinding with diamond cup wheel.

Power is supplied to the spindle, which is of chrome nickel steel and mounted on four pre-loaded precision ball bearings, by adjustable V-belts driven by a 1 hp motor.

Prices and further information on the Hammond 10″ Carbide Tool Grinder will be furnished by Hammond Machinery Builders, Inc., 1631 Douglas Ave., Kalamazoo, Mich.



To the Men Behind the Men Behind the Guns

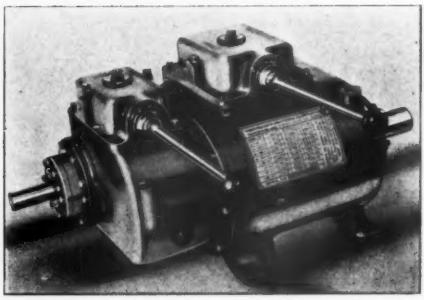
The L. S. Starrett Company takes this opportunity to pay tribute to the thousands of skilled craftsmen whose ability and energy have made America what it is today . . . and whose loyalty and integrity are helping to keep it that way.

THE L. S. STARRETT CO., Athol, Massachusetts, U. S. A.
World's Greatest Toolmakers

STARRETT

PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

New 30 h p Capacity Transmission Announced



A NEW Western SUPER transmission with 30 hp capacity for motorizing Cone driven machine tools is announced by Western Manufacturing Company, Detroit, Mich. The new unit is suitable for replacement of gear boxes on large boring mills, radial drills, etc. and can be used to motorize large slotters, engine and turret lathes.

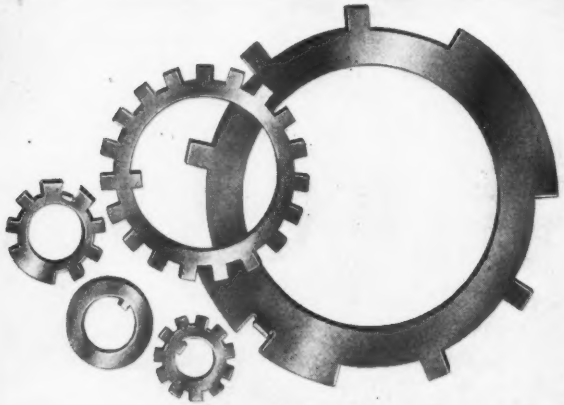
The SUPER transmission has eight changes of speed in geometric progression of 1.29—maximum reduction of 6 to 1. All gears and shafts are made of alloy steel, heat treated. Shafts run on anti-friction bearings.

The Western line of transmissions now consists of three models which will take care of motorizing machine tool equipment from 1 to 30 hp — the Master (1-5 hp), the Major (5-10 hp) and the Super (10-30 hp).

All three models are adapted to all kinds of machine tools with three models of Multi-Motor Mounting: (1) Lathe Bracket, also for motorizing automatics, bolt cutters, Fellows gear shapers, vertical milling machines, radial drills, turret lathes, screw machines, etc.; (2) Shaper Bracket, also for boring mills, vertical mills, etc.; and (3) milling Machine Bracket.

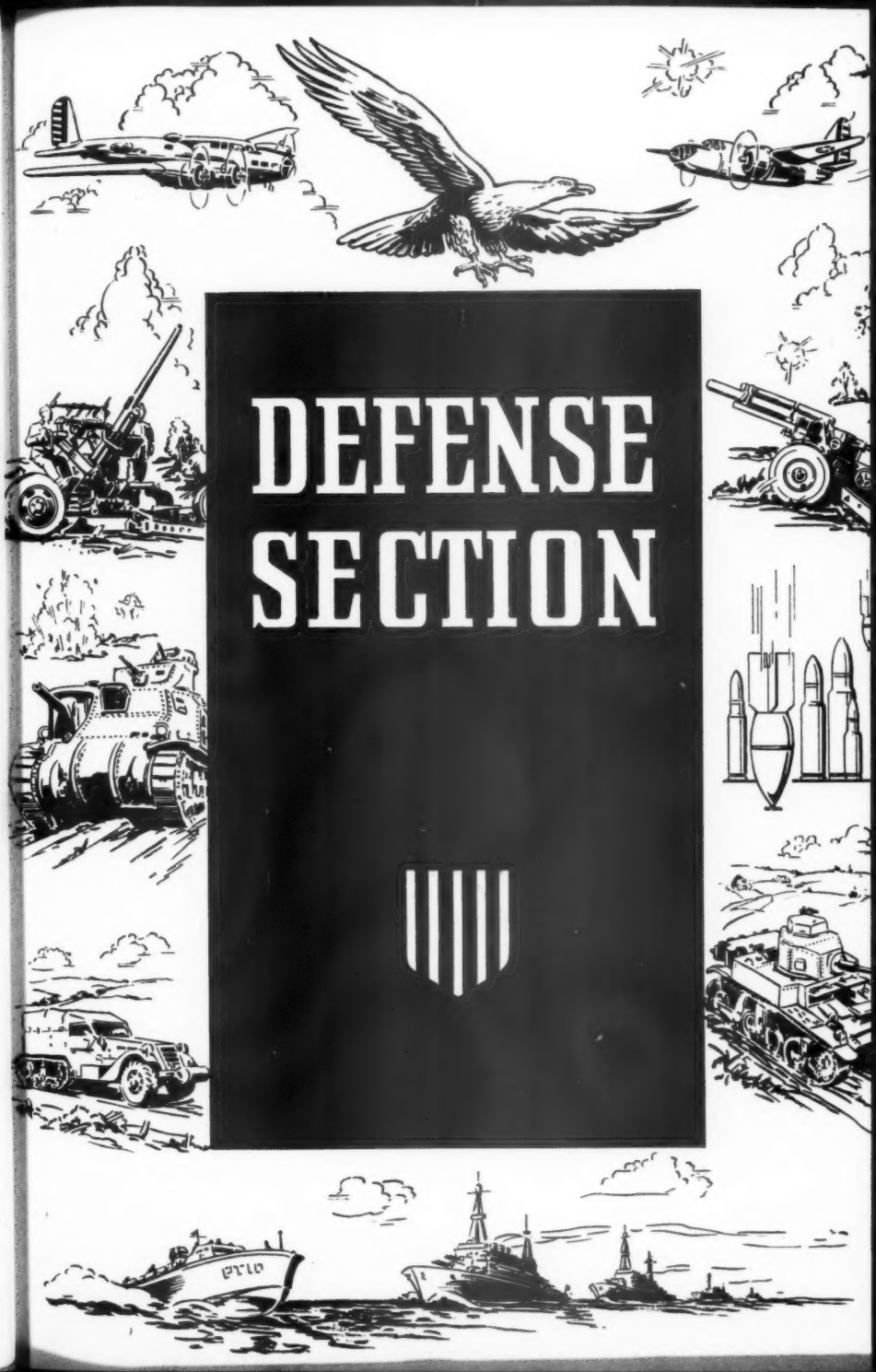
Specifications and installation data on the new Western Super Transmission are available. Write Western Mfg. Co., 3414 Scotten Ave., Detroit, Mich.

SPECIAL CUSTOM MADE LOCK WASHERS



Under our special die stamping process, you are now able to get 100 special custom made stamped, either lock or thrust washers, according to your definite requirements, at a comparative cost of eight or ten hand made washers. Our present capacity ranges from ½" to 12" diameter—of any sheet alloy that will lend itself to the conventional type of die stamping of sheet metal parts. This service is of considerable advantage to the machine tool trade, as well as machinery manufacturers. All lock and thrust washers are produced on a special compound die of our design.
Representative samples and additional information may be had on request.

DAYTON ROGERS MFG. CO.
Minneapolis Minnesota


DEFENSE
SECTION

Letter from Washington

By George J. Huebner

CONVERSION of such a thoroughly peace-time industrial system as ours to all-out war is a herculean task. The sums to be spent are beyond comprehension. The specified production schedules stimulate the most vivid imagination. Notwithstanding, there probably are few individuals in our own country or in the world-at-large who would question our ability to achieve them, given time enough.

Time is the important factor. All of the ships, planes, tanks and other war needs which $59,000,000,000 will provide, will not of themselves win the war in the period that we expect them to, unless they are produced and transported in time. "Time is Short" is one of the early Defense slogans. One sees it everywhere in OPM offices and in Defense plants. In this stupendous job of arming the world against aggression time must be considered one of our enemies. It must be completely "licked" first and we must do it in every industrial area and on every farm in our country before ever we can hope to win over the Japs or the Nazis.

Because we bickered and argued about inconsequentials, indulged in labor strikes and attempted "business as usual" at one of the most critical times in world's history, American forces at Manila are in grave danger. Who can think about the brave little group of Marines on Wake Island without a pang of conscience as to what might have been if they had had adequate fighting equipment? And who will deny that there might not have been greatly reduced casualties at Pearl Harbor, even with the surprise element, if more planes had been available?

Time—time necessary to arm—almost defeated Great Britain. *Time* won for Germany one country after another and today the *time* necessary for us to produce adequate planes and guns and ammunition is making tough going for the British at Singapore.

Victory will never be attained only as the result of wealth and possessions or even production capacity. Britain was wealthy in the products of commerce while Germany declared its wealth in terms of the work of its people. So far which has more effectively proven its worth in the business of war? Only as we overwhelmingly convert our dollars into fighting tools will they demonstrate their value. Our abundance of raw materials, our steel mills, our manufacturing plants and their ever increasing complement of machines and tools must be translated into weapons *at the front*. Our man-power even with its indomitable fighting spirit can win battles only with superior mechanical equipment and adequate transport.

Conversion of dollars into armaments cannot be looked upon as the work of a few. It is unqualifiedly the responsibility of every worker and every employer without consideration of size. It may be true that 53 percent of all defense contracts originally were given to 15 prime contractors. Today the effort to draw into the nation's production set-up every plant that can perform any needed service is being conscientiously carried forward by the Government Buying Agencies and particularly by the Division of Contract Distribution of the OPM. Unless the need for a certain type of facility is critical, it may not be the subject of intensive search. In such instances executives and owners of shop facilities must sell themselves and their plants to prime contractors and the Buying Agencies exactly as they do to their customers during periods of normal business. It sometimes occurs that a plant owner who needs business must himself find the part or product he can make by conversion of his facilities.

But, regardless of the procedure required, it must be emphasized that in this all-out effort to produce the overwhelming implements of war *every man* must accept his responsibility and contribute generously of his time, his effort and his money to the end that *time*, the enemy that is in our midst, be laid low.

TIME is SHORT.

The Design and Layout of Progressive Dies

Part III

By Ernest Mehwald
Atlantic Tool & Die Co., Inc.

This is the third and concluding installment of Mr. Mehwald's material on progressive die design. In this article problems involved in complicated progressive dies are discussed. The disadvantages or limitations of progressive dies are outlined from the point of view of a practical designer.

This series of three articles will be available in a reprint. Write the publication office of The TOOL & DIE Journal.

—The Editor

WHILE these few precautions will show a decided improvement in running a fairly simple job, they may not be enough when it comes to a more complicated die construction.

With the perfection of better feeding devices and more suitable presses, progressive die work reaches deeper and deeper into the production of more complicated parts. The elimination of separate operation dies and the production of piece parts in the fewest possible press operations is a constant goal of modern manufacturing technique. Progressive dies with forming, flanging, embossing, curling, lancing, coining stages, etc., in combination with all kinds of cutting operations, are commonly built. As a whole, they are extremely difficult to bring under rules and regulations. They are individual problems; each requiring individual design and construction. Progressive dies usually do not run at the first trial. "Bugs" will have to be taken out here and there. Getting jobs of the complicated type in running condition frequently takes as long or longer than building the die if the die has not been designed with extreme care.

In estimating such jobs allowances must be made for this. The designer must try to visualize each operation and check and recheck the actual actions and workings of the material from stage to stage. It is a good rule to lay out the stations of the die so that provisions can be made for additional stations if these are found necessary later on. Provide for those additional stations whenever possible.

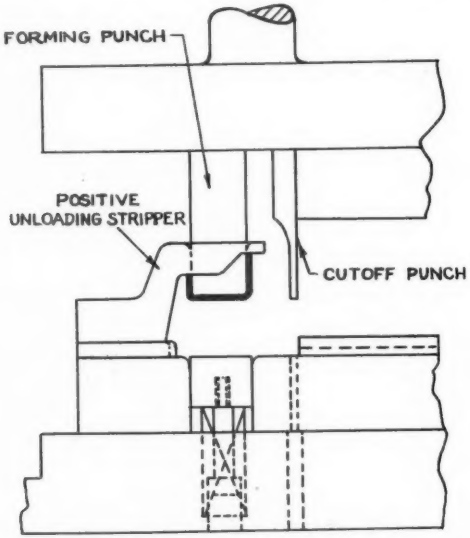
In a progressive die where drawing or embossing, notching and piercing, forming or flanging, or curling and final cut-off or blanking is required, we find several factors which influence a successful die construction.

One is the change from an even strip to a formed project. Strain becomes apparent in the material, hardness of material ceases to remain uniform and fractures appear. These physical changes of the material are usually not evenly distributed. We might have forming operations on two sides or on one side only. They may be in any location of the part. There might be formed-down or formed-up contours, or both, depending on the part to be produced. The physical prop-

erties of the material may represent a mass of distortions. In an arrangement of a number of stations where accuracy and exact relationship from station to station are required, this is a fundamental consideration. The design, therefore, must try to remedy these conditions for practical performance. It must allow the metal to flow into formed contours without dislocating any other working areas. Notches or pierced openings which have nothing to do with the part to be produced might have to be incorporated. Holding devices to keep out wrinkles or prevent slipping of stock may be necessary.

work against each other. While cutting punches raise the strip up against the stripping surface of the solid stripper, the spring pressure holds the material down against the die face. The material is subject to bending and distortion which cannot be entirely avoided in this case. However, it can be minimized by eliminating sharp breaks in the material. Wherever possible allow space for a gradual bending of the strip. Positive strippers should not be too close to spring action strippers.

As a precaution against breakage, dies of the complicated type should also have devices connected with the press move-



A positive unloading stripper as shown is frequently necessary to clear cutoff and formed parts. Air is always used to complete the removal of the stripped part.

Another difficulty in the general run of complicated progressive dies is the stripping and freeing of parts from punch or die, necessary for uninterrupted feeding. While all the small details previously described help to improve the running of the job, they are not positive enough.

In many cases both stripper types—positive stripper on lower die for cutting stations, and spring stripper on upper die for holding metal while forming—will have to be used on the same die. They

ment. A positive switch, which stops operation when feeding is blocked or incomplete, saves possible damage to the die, curling or piling up of material.

As a whole, complicated progressive dies require a great amount of detail work. Intricate and complicated parts should be carefully studied by both designer and die maker to determine whether they should be produced in a progressive die, or in another separate die operation. There is a limit of accu-

racy and the number of forms that can be produced in one die with efficiency. Wishful thinking is never a substitute for sound judgment based on experience.

Disadvantages

In a survey of any technical problem, the analysis would not be complete if disadvantages or weak points were not clearly stated. In order to find ways and means of better design and construction those disadvantages must be known. Progressive dies, like others, have their weaknesses.

Every pierced, notched and blanked part produced in progressive dies shows the burrs of holes and notches in opposite direction to the blank. Burrs will be on both sides. While this is not necessarily important on many parts, it is often inconvenient for further part operations. Curling up of notched or sheared lugs, etc., will be harder to start. Forming surfaces wear fast with burrs riding over them. The blank also does not remain as flat as, for instance, in a compound die. The closer holes are to the outside contours of the blank, the less flat the material remains. Heavy stock is particularly subject to distortion.

Another weak point, as far as construction is concerned, will be noticed on cutoff and forming dies where the cutting has to be completed before forming can start. Due to the depth of such forms, the cutoff punch may have to enter deep into the die. This is not desirable because of the excessive wear on the cutoff punch and the increased danger of breakage.

Progressive die construction cannot be applied satisfactorily to large parts; very seldom even to medium areas. They are more or less limited to relatively small parts.

Another limitation to the use of progressive dies is that some part shapes simply do not allow full blanks to be cut from start to finish of the strip. Incomplete cuts sooner or later are bound to affect shearing of punch and die.

These are some of the disadvantages of progressive dies which construction cannot easily overcome, but which the designer should consider in designing dies of the progressive type.

Reprints of this series are available. Address your request as directed in the head note, page 47.

PLASTIC GAGE HANDLES

Made In 5 Sizes

Federal Plastic Gage Handles were developed to release, for other more important purposes, metals usually used for handles. They are made to standard dimensions, they are durable and much lighter than those made of metals.

The cost is surprisingly low.

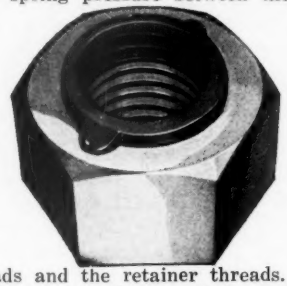
Write For Circular

FEDERAL TOOL CORPORATION

400 N. Leavitt St. CHICAGO

New Gripping Element in One-Piece Security Nut

IN answer to the age-old problem of securely holding the common nut onto bolts, Security Metal Products, Inc., claim the development of an entirely new principle. Something new has been added to the bolt gripping element of the Security Nut. It consists of a spring steel retainer, inserted and permanently seated in the head of the standard nut. This retainer is made elliptical in shape. When the nut is applied to a bolt, this retainer is distorted from its elliptical into a circular shape, setting up a powerful spring pressure between the bolt

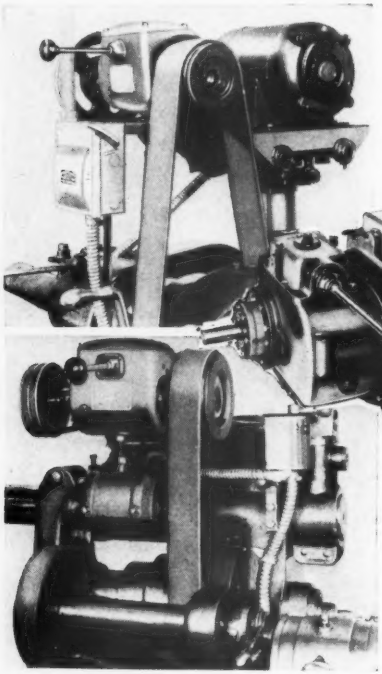


threads and the retainer threads. The Security Nut can be reapplied repeatedly.

It is the distinctive design and principle upon which the Security Nut is built that accounts for its absolute holding power. It defies vibration whether the bolt is loose or tight. It defies shocks, and action of the elements and all other loosening tendencies. This nut is started on the bolt with the fingers, just like a common nut, and a wrench is used when the threads of the retainer start to engage the threads on the bolt. The Security Nut is applied, removed and reapplied as a one-piece nut.

Such additional advantages as tightening the nut after the bolt does get loose is easily done by turning up with a wrench like any common nut, and its grip is as strong at the final location on the bolt as it was when first applied.

Send for illustrated Circular No. 10, listing the fourteen advantages of Security Nuts. Address Security Metal Products, Inc., Dept. TD, Saugatuck, Mich.



Western MASTER (1-5 h. p.) on a Warner Swasey turret lathe, bracket included . .

Western SUPER (10-30 h. p.) suitable for replacing gear boxes on large boring mills, radials, etc. and to motorize large slotters, engine and turret lathes.

Western MASTER (1-5 h. p.) on a Cincinnati No. 2 milling Machine, bracket included . .

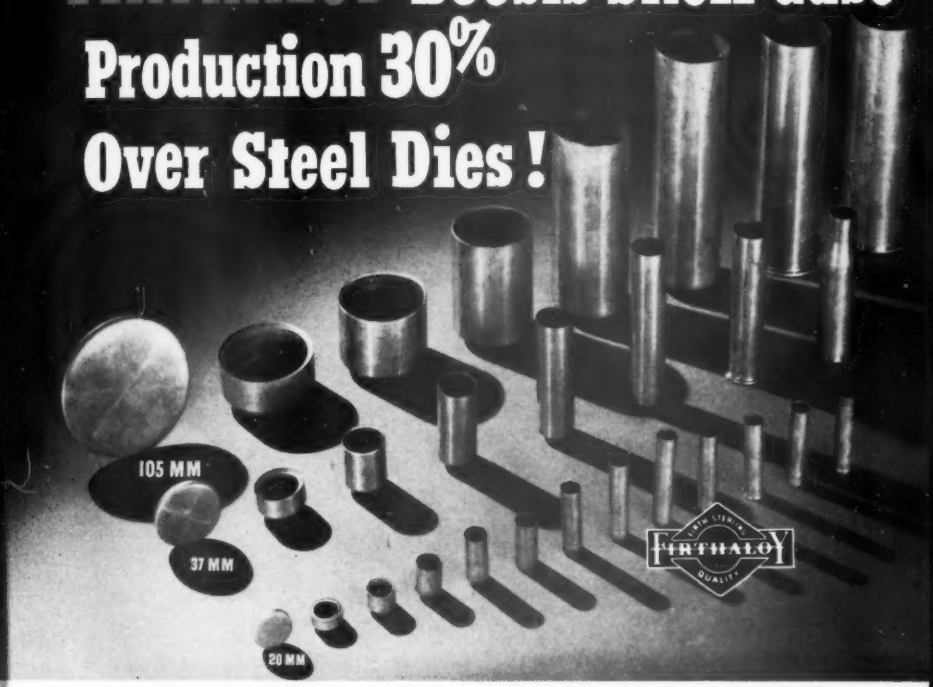
New Models **WESTERN TRANSMISSIONS**

A MASTER, capacity (1-5 h. p.), A MAJOR, capacity (5-10 h. p.) and A SUPER (10-30 h. p.) can also be installed on shapers, radials. slotters, boring mills, gear cutters, die sinkers, etc.

WESTERN MANUFACTURING CO.

3414 Scotten Ave. **Detroit, Mich.**

FIRTHALOY Boosts Shell Case Production 30% Over Steel Dies!



SPOTLIGHT ADVANTAGES OF FIRTHALOY CARTRIDGE DIES:

Greater wall reduction per pass decreases number of passes; one or more draws eliminated.

Smoother, scratch-free finish and higher quality results in fewer rejects.

From disc to case 30% to 35% faster with cheaper shell for shell cost.

Less give, sink and wear because of FIRTHALOY'S near-diamond hardness and remarkable resistance to abrasive wear.

Longer runs; less unproductive down-time; greatly reduced die cost.

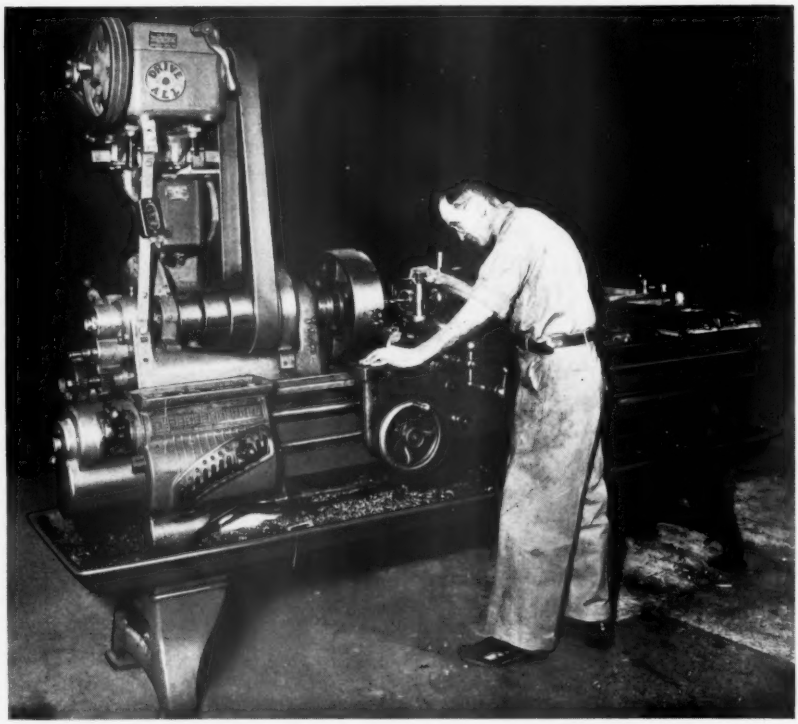
**FIRTHALOY is a Sintered Tungsten Carbide.*

FIRTH-STERLING STEEL COMPANY

McKEESPORT, PA

DRIVE-AL

C



Drive-All Units can be installed on any machine. The increase in efficiency quickly pays for the units. Drive-All Units are also used as original equipment by machine tool manufacturers.

The list of leading users of Drive-All Units reads like an honor roll of the metal working and production manufacturing industries.

Write for new Bulletin and address of representative in your city.

Prompt Deliveries!

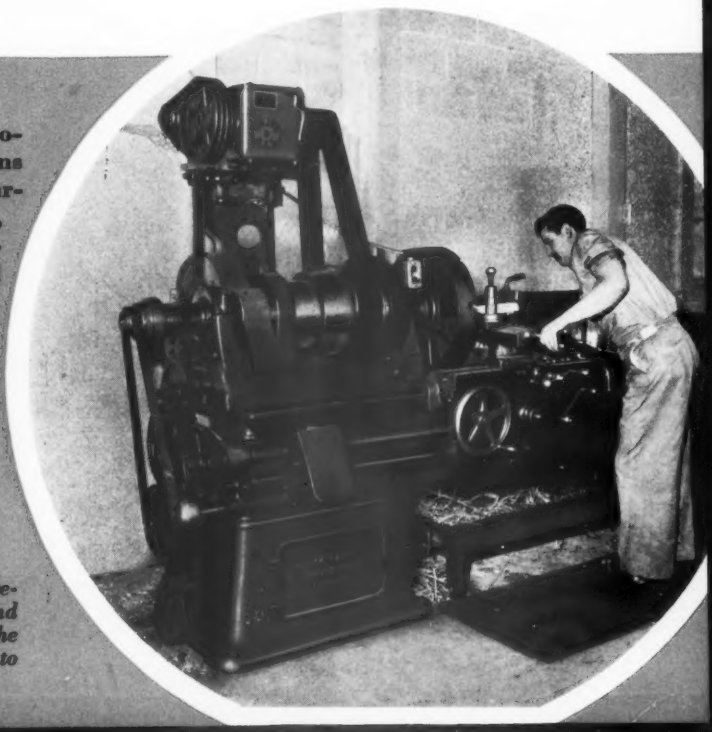
LL

MACHINE TOOL BUILDERS
AND MANUFACTURERS
OF POWER EQUIPMENT

COMPLETE UNIT TRANSMISSIONS

Drive-All Motorizing Units are shipped ready to install with correct speed motor, the proper type and size bracket, and adjustable motor rails. The Standard Unit, for motorizing machine tools requiring from 1 to 5 HP, can be installed in an average of two hours.

he ...vy Duty Drive-All Mo-rizi... Unit for installations hat ...uire 5 to 10 HP is fur-ish... ke the Standard Unit, ith ...her 3-speed or 4-peed ...r boxes. Gears and haft ...ut from chrome ick... eel and electrical-y he ...reated, operate in ba... oil.



Illus... s show two recent Drive-Uni... allations in a Cleveland ract... and Die Shop. The ting... se in production led to ... ap... ns in the same shop.

DRIVE-ALL
MANUFACTURING COMPANY
3400 CONNER AVE. DETROIT, MICH.

"MAKE THEM IN TANDEM"

If you use tubing in place of bar stock in the fabrication of cylindrical parts it is often possible to make multiple parts in tandem.

There's less cycle time per part, faster speeds and less down time, too.

THE TIMKEN ROLLER BEARING CO., CANTON, O.
Steel and Tube Division

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

ALLOY STEELS

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

LOOK AHEAD!
Save time and materials now to make money tomorrow.

THE SCHERR LIMITED BUDGET
INSPECTION LABORATORY

1. **THE WILDER PROJECTOR**
The Wilder Projector enables you to see exactly where tools, templets, gages, threads, etc., vary from specified dimensions and contours, and how much they are out. Magnifications available from 10x to 100x. PRICE.....$267.50 F.O.B. Waltham

2. **A SET OF GAGE BLOCKS** accurate within .000008" is a necessity to provide the basic standard of measurements, from which all production starts and all measuring tools and gages, used throughout the shop, are checked and set. There are large and small sets of our Ultra-Chex lines to suit all requirements.
34-block set.....$125.00 F.O.B. New York
Note also Adjustable Snap Gages.

3. **SCHERR COMPARITOL**
Gives accurate dependable readings in 1/10000". Gage blocks, plug gages, tools are checked for size, tolerance and wear. Mass produced parts such as bearings, pins, bushings, are rapidly checked without dependence upon the skill or "feel" of the operator. Standard size 0-6" size.....$195.00 F.O.B. New York
Heavy-duty 0-8" size.....$250.00 F.O.B. New York

4. **OPTICAL PARALLELS**
Required to inspect the surface of gage blocks, lapped surfaces of all kinds and parallelism of micrometer anvils. Single parallels.....$10.00
2 Parallels, ½ turn of micrometer screw.....$25.00
Set of 4 one-half inch thick.....$85.00
Set of 4 about one inch thick.....$90.00

5. **SET OF REED PRECISION MICROMETERS**
1" and 2" in 1/10000", 3, 4, 5 and 6" in 1/1000", complete in case, PRICE.....$67.73

6. **SPENCER BINOCULAR MICROSCOPE**
With three dimensional vision reveals scratches, surface finish, imperfections which cannot be seen with ordinary microscopes showing one plane of vision.....$153.50

SAFEGUARD YOUR PRODUCTION FROM THE SCRAP PILE

Quick production is not your only problem. Machine tools may be speeded up, hours saved by better set-ups, over-time and extra shifts may be installed. Yet this will be of no avail or benefit to anyone if the accuracy of your product is lost with your material ending on the scrap heap. The best investment for any shop is in inspection tools to detect and eliminate the errors at the source, before they can affect production.

Give your men the right tools to measure with. Remember that whether you manufacture to close tolerances of "tenths" or to wide tolerances of plus or minus .002", you must still start with the basic accuracy in tenths of thousandths or else your work will not interchange with that produced in other shops.

Invest in the Scherr Limited Budget Inspection Laboratory to guard against future rejections, disputes and loss of time, labor and material. *Write, wire or telephone Canal 6-1464 for quotation and delivery dates, complete literature.*

GEO. SCHERR CO., INC.

128-B LAFAYETTE ST.
NEW YORK, N. Y.

Colonial Increases Capacity of line of Junior Presses

COLONIAL Broach Co., 145 Jos. Campau, Detroit, Mich., has made a number of changes to increase work-handling capacity for precision assembling and straightening, in the design of its Junior presses and has condensed the line to two models. Smoother and faster than mechanically operated presses, the line now includes hydraulically operated units rated at ½ and 1 ton capacities, both with 12 inch stroke and designated as Models VJ1-1000-12 and VJ1-1-12 respectively.

The two models are similar in design and construction, with principal dimensions the same for both. Both are suitable for mounting in virtually any location. Revisions in the dimensions of these presses include an increase in platen depth from 8 to 9½", with an increase of ½" to 5½" in the throat.

By the use of special coolant equipment, light broaching can be done on these machines. Control of the ram stroke is through a four-way manual valve.

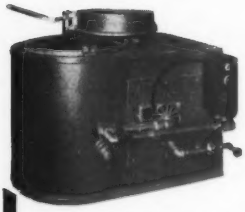
The hydraulic system includes an adjustable pressure relief valve. Provision is made for the installation of a pressure gage on the column for use in assembly work where exact press-fit tolerances are important. Thus equipped, the reading of the pressure gage during assembly will indicate the character of the fit, thus serving as an inspection device.

For further details and literature describing Junior Presses, address Colonial Broach Co., 145 Jos. Campau, Detroit, Mich.

"NEVER THOUGHT IT POSSIBLE"

Says Bill Sweet,

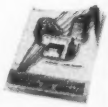
President, Twin City Steel Treating Co., also instructor, Wm. Hood Dunwoody Industrial Institute



Now we get greater production speed with absolutely no rejects . . . . .

★ ★ ★

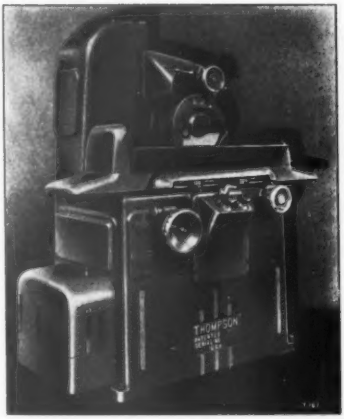
In our commercial shop the Despatch furnace is used to accommodate all types of work and all loading conditions at any desired temperature. Furnace accuracy, work chamber uniformity and remarkably low operating costs are accomplished in the heat treatment of low carbon steel, high carbon steel, and alloy steel parts . . . aluminum alloy, magnesium alloy, brass and other non-ferrous castings, forgings, sheets and shapes with DESPATCH FURNACES . . . temperature range 275° F. to 1250° F.



Write today for Bulletin No. 81-0

DESPATCH OVEN COMPANY MINNEAPOLIS MINNESOTA

Thompson Introduces Type F Tool Room Surface Grinder



THE Thompson Type F Tool Room Surface Grinder, developed by The Thompson Grinder Co., Springfield, O., to meet the demand for a small, sensitive, high speed tool room and production grinder, is equipped with both hydraulic and hand feeds to the table and wheel movements. The hand table feed is automatically engaged when the hydraulic power is shut off either by the table throttle or by stopping the hydraulic pump. The bed, of the double length box type, houses both the coolant and hydraulic systems, making the machine an entirely self-contained unit.

All controls are centralized with instantaneous response to the operator's touch. A unique feature in the inclined control panel which places the work and controls within the normal vision of the operator.

The Type F is equipped with 12-inch diameter wheels for satisfactory results without frequent and costly wheel truing.

A swivel or plain type vise makes possible the grinding of special tools on this machine. The Thompson tool room surface grinder may also be equipped with a Hardinge Collet Index Fixture, thus permitting the grinding of punches and similar tools with flats, squares or hexagons.

The Thompson Grinder Co., Dept. TD, Springfield, O., has issued Catalog No. F-41 which describes the many features of their Type F Tool Room Grinder.

RACINE
Variable Volume (oil) Hydraulic Pumps and Valves ready made for your requirements. Dependable fluid power for pressures up to 1000 pounds p. s. i. Write today . . . let our engineers help you solve your problems.
RACINE TOOL AND MACHINE COMPANY
1768 STATE ST., RACINE, WISCONSIN

Clark Hardness Tester Features Methods of Making Minor Adjustments

A NEW outstanding feature of the Hardness Tester, distributed by Instrument, Inc., Dearborn, Mich., includes the method of making minor adjustments. This sturdy instrument for direct hardness readings on hardened and soft steel and non-ferrous metals has three simple adjustments to compensate for minor difficulties: (1) adjustments for increasing or decreasing minor load; (2) a gap adjusting screw; and (3) the indicator holder. The dashpot controlled main beam has an adjustment for increasing or decreasing the acceleration speed.

The Tester uses a diamond penetrator, a $\frac{1}{16}$" and a $\frac{1}{8}$" ball penetrator, with a major load of 150 kg. and a minor load of 10 kg.

Two sets of numerals on the Federal Dial Indicator make direct reading easy. Black numerals give direct readings when the diamond penetrator is used; the red numerals give direct readings when the $\frac{1}{16}$" or $\frac{1}{8}$" ball penetrator is used.

The Clark Hardness Tester is available in two standard models.

Standard equipment shipped with each instrument includes a diamond penetrator, $\frac{1}{16}$" and $\frac{1}{8}$" ball penetrators, checking anvil, $3\frac{1}{2}$" anvil, "V" anvil and leather cover for instrument.

For literature and a chart giving approximate conversions, operating instructions and other important details, address the exclusive distributor, Clark Instrument, Inc., 10200 Ford Rd., Dearborn, Mich.

NEW ...FASTER!... ...MORE ACCURATE

DRY OR WET

Hammond "14"

HAMMOND CARBIDE TOOL GRINDERS

The most modern Carbide Tool Grinder available — the Hammond "14" — incorporates innumerable advantages for faster and more accurate carbide tool grinding. It is available for either wet or dry grinding and tables are mechanically controlled.

WRITE TODAY FOR BULLETIN GP-14A

- THE HAMMOND "4"
- THE HAMMOND "6"
- THE HAMMOND "10"
- THE HAMMOND "14"

Hammond Machinery Builders INC.

1631 DOUGLAS AVENUE • KALAMAZOO • MICHIGAN

"Carboloy Tool Manual"

ENGINEERING Bulletin GT-133, "Carboloy Tool Manual", a 32-page booklet, is the most complete survey of the design, application, grinding and brazing of Carboloy tools issued. The section on tool design is liberally illustrated by drawings and charts; as are also sections on chip breakers, tool holders and tool setting devices, grinding and brazing.

Such data as the use of shims, coolants and tool handling are given in brief, but practical detail. There is a guide to the characteristics of Carboloy cemented carbides, six tables of Carboloy recommendations for steel cutting, ferrous castings, non-ferrous and non-metallics. Specifications and applications of Carboloy standard tools, as well as suggested special tools that can be easily and rapidly adapted from standards are given.

The application data includes specimen problems of calculation of horsepower required for machining materials at specified depths of cut and feed per revolution. Suggestions also cover power transmission and chip room.

The section on tool handling outlines an efficient plan for the handling and control of tools; the grinding and maintenance of Carboloy tools. This section also includes general operating hints for carbide cutting tools.

For your copy of Engineering Bulletin GT-133, "Carboloy Tool Manual," write Carboloy Co., Inc., Detroit, Mich.

Meehanite Issues Handbook

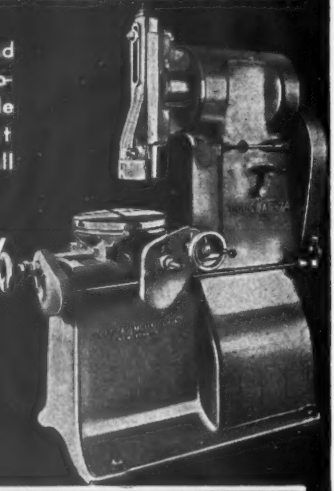
A COMPLETE handbook on Meehanite castings, describing their manufacture, metallurgy, heat treatment and engineering properties has just been issued by the Meehanite Research Institute of America, Inc., Pittsburgh, Pa.

Although a nominal price of $1 has been established for the Meehanite Handbook, copies will be sent free by Meehanite Research Institute of America, Inc., 311 Ross St., Pittsburgh, Pa., to designers, engineers, machinery manufacturers and other men of industry who can use the data it contains. In requesting a copy please give your title and write on your business letterhead.

Douglas PRECISION SLOTTER

FOR TOOLROOM AND PRODUCTION

Swiveling ram head and tool holder, automatic circular table and independent automatic feeds in all directions.



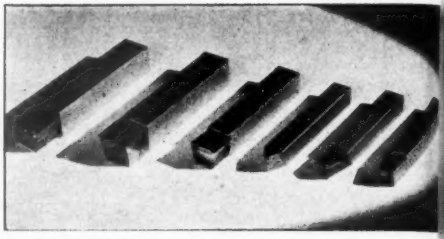
Prompt Delivery by Large-Scale Production

Built with 7", 8", 10" Stroke

DOUGLAS MACHINERY CO., INC.

150 BROADWAY, NEW YORK, N. Y., Dept. 80-6

Tungsten Carbide Tool Announces New Line of Carbide Standard Tools



A COMPLETE line of standard "stock" carbide tipped cutting tools, comprising six styles and 46 stocked sizes, is announced by the Tungsten Carbide Tool Co., subsidiary of Michigan Tool Co., Detroit, Mich. Produced to meet the growing demand more quickly and satisfactorily, all tools have diamond ground edges and are ready for immediate use. The tools are designed to cover the large majority of all turning, boring and facing requirements and may be readily converted by the user into special shapes by simple grinding operations at an actual saving over the purchase of "special" tools. Types suitable for cast iron, non-ferrous metals and for steel are included in the line.

Since these tools are made up on a mass production basis, they have an unusually low price, depending upon style, size and quantity with minimum prices available on orders of only 10 tools of the same size and style.

Due to the broad range of available styles and sizes, the company recommends that these standard stocked tools be purchased wherever possible. All styles and sizes in four grades are now available for immediate shipment. Other grades of Vascaloy, Carboloy, Kennametal, or Firthite, available at no increase in price, can be delivered within one week.

A Bulletin giving complete specifications and prices is now available. For your copy, address Tungsten Carbide Tool Co., 7169 E. McNichols Rd., Detroit, Mich.

PRODUCE FOR VICTORY!
Enlist
WITTEK
Automatic
ROLL FEEDS AND REEL STANDS
Wittek Automatic Roll Feeds and Reel Stands provide improved and simplified methods of punch press operation. They are easily mounted on any make or size punch press and assure fast, safe and accurate feeding under all conditions. Wittek Roll Feeds are made in four different types to meet all automatic feeding requirements.
Write for Descriptive Catalog
WITTEK MANUFACTURING CO.
4305-15 West 24th Place, Chicago, Illinois.

Threading Equipment Bulletin

THIS new Bulletin by the Landis Machine Company, Inc., Waynesboro, Pa., describes the LANDMACO Threading machine, Shell Tapper and accessories. The LANDMACO Threading machine can be equipped for either internal or external threading — the LANCO Head for external thread cutting on the LANDIS Collapsible Tap for internal threading. The machine is unusually flexible, permitting quick tooling-up. Design features include 8-speed selective type gear box, chrome nickel steel gears, spiral bevel gear spindle drive, double wall bed construction under each carriage guide, self contained coolant system and universal adjustment for vise alignment.

The LANDMACO Threading Machine can be arranged for threading a wide variety of shell, bomb and mine parts. The Bulletin illustrates representative jobs, specifies added equipment and gives production rates.

The 1½ LANDMACO Shell Tapper for tapping 75 mm to 155 mm shell is a precision machine designed especially for tapping shell noses. One machine and one universal feature handles all sizes as noted. This tapper produces threads faster than other methods previously used, assuring a steady, uninterrupted flow of shell. Production figures for all American shell 75 to 155 mm are given.

For threading many small parts such as fuse bodies, shell adapters, bomb parts and lifting plugs—work that can be done on multiple purpose automatic screw machines — Landis offers the LANDMATIC Heads, the LANCO Die Heads and the LANDIS Collapsible Taps. All these tools — made of high carbon and special alloy steels—assure threads of the fine accuracy required in the production of munitions.

An advantage of all Landis equipment that is especially important at present is that these machines, die heads and taps can be operated by unskilled, or even by women labor.

For your copy of "Precision in Munitions Threading" write to Landis Machine Co., Inc., Dept. TD, Waynesboro, Pa.

SLOTMASTER

A slotting head that can be used on milling machines provides double duty facilities at a minimum of cost. It requires but little time to change over from one head to the other and back again . . . The SLOTMASTER can be used as a vertical slotter and shaper and is operated over a milling machine table as illustrated. The stroke of the ram is adjustable from 0 to 4"—the speeds range from 50 to 250 strokes per minute . . . The tool holder, of the clapper-box type, can be turned in any position . . . All of the working parts are of tool steel, heat treated and ground to close tolerances . . . it comes complete with pulleys, motor, belt and with mounting adaptable to round overarm or Bridgeport millers.

ABOVE: SLOTMASTER installed on a round overarm milling machine.

RIGHT: Cutting keyways on compound angles (Bridgeport).

Send for 4-page catalog and complete information.

EXPERIMENTAL TOOL & DIE COMPANY

12609 Greiner **Detroit, Mich.**

Typical Designs for Drilling Jigs and Fixtures

(Continued from Page 31)

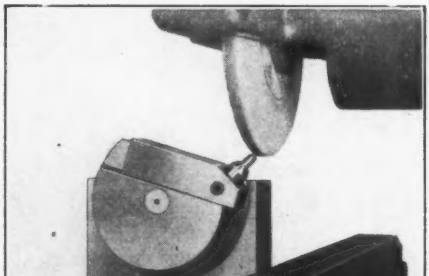
justed to suit the 1¾ in. dimension for a closed leaf. The adjustments are made by grinding or changing the hardened wear pin D.

The latch hook is kept in a closed position by a flat spring, but other types of springs can be used. Details of the latch are shown in Fig. 2. One special feature here is the 2 degree "hook" in the latch jaw; this prevents the jaw from loosening its hold when taking the drilling thrust. Another feature is the location of the hinge pin hole; its center is shown midway under the width of jaw, and is therefore on the "dead-center" line E, being the neutral thrust of forces on the latch jaw. This is an additional precaution that prevents the jaw from loosening its hold during the drilling interval.

The seven holes in this jig body are for ⅜" diameter drills. The normal pressure required in feeding one sharp drill, of this size, into cast iron, at the rate of a 5" depth per minute, at 0.008" feed per revolution, and 625 rpm, giving 62 circumferential cutting feet per minute, is 360 pounds. For a dull drill, the required pressure may increase 50 percent, or to 540 pounds. If the seven holes were drilled in multiple, the required pressure will exceed 2500 pounds for seven sharp drills, and over 3700 pounds for seven dull drills. These figures indicate the importance of designing good fastenings in jigs, as well as the reasons for avoiding the use of dull drills. However, this jig was designed for drilling one hole per "strike." If multiple drilling were required, two latch hooks would be necessary, instead of the one shown.

A short formula for determining the circumferential travel T, in feet per minute, for any diameter D, of a drill, milling cutter, pulley, or work in a lathe is: $T = 0.262 \times D \times rpm$, in which 0.262 is a constant.

WELCH *Quick Angle Dresser*



For a ten days' free trial in your own shop, write today specifying whether the plain or vernier type is desired. Quick Angle Dressers can be built to special requirements.

Has the features that practical men will appreciate.

1. Quickly set at any desired angle. (Plain Dresser graduated in degrees. Vernier Type Dresser reads in degrees and minutes.)
2. Knurled hand knob locks dresser for use. Simplicity of design saves time of experienced men. Gives confidence to less experienced men.
3. Dresser is small and compact. Every operator should have one.
4. It is made of hardened and ground steel for long, trouble-free service.

The Quick Angle Dresser, furnished with one diamond, is carried in stock for prompt shipment. Each unit is ready for immediate use.

Plain Type $70.00 net, complete with one diamond. Vernier Type, Price $82.50 net, complete with one diamond.

WELCH INDUSTRIES, INC.

19901 W. Eight Mile Road **Detroit, Mich.**

Selective Strippers Added to Wales Die Line

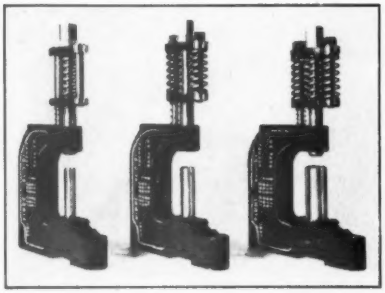
SELECTIVE strippers, the latest development in the complete line of Wales Hole Punching Dies, have been announced by The Strippit Corp. of Buffalo, N. Y.

These new Wales patented strippers with 3 instantly removable and interchangeable springs provide a tension selection of 1, 2, or 3 spring pressure for the exact stripping action required by various gages and types of metal. Any metal that can be punched can be stripped with tension of 3 springs. Simplicity of design of selective stripping makes changes of pressure practically instantaneous. Lighter gage metals not requiring full stripping pressure can be punched on smaller, more economical presses by eliminating unnecessary high spring pressure.

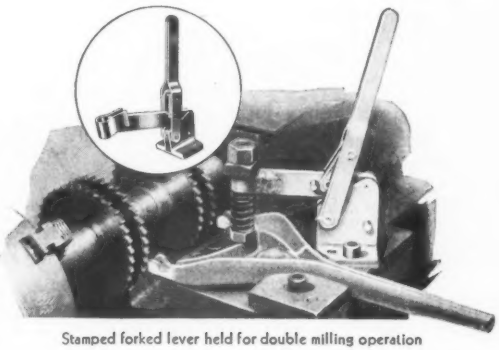
Wales Dies save time because they are self-contained units. Each individual unit may be reset or removed from the rail quickly. The punches, guides and springs may be removed from the holders instantly, and the new Selective Stripper makes it possible to punch $\frac{5}{16}$" holes on ¾" centers.

The rapidity with which these parts can be removed and replaced in the holders and re-setting of entire unit keep presses in operation practically continuously — die-setting time is cut from hours to minutes.

Wales Hole Punching Dies are available in a wide range of standard and special sizes, capacities and models.



For complete information on Selective Strippers write The Strippit Corp., 1203 Niagara St., Buffalo, N. Y.



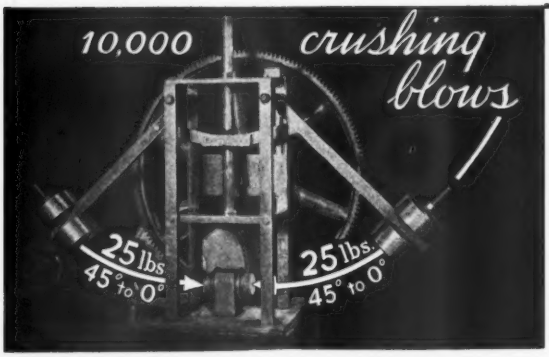
Stamped forked lever held for double milling operation

for Low Cost Production Use DE-STA-CO Toggle Clamps

In every operation where parts must be held in fixtures for drilling, milling, welding, assembly and the like, the production *rate* depends upon positive clamping—and instant release . . . And production *costs* likewise.

De-Sta-Co quick-acting Toggle Clamps are nationally recognized as the efficient, low-cost method of designing and carrying out production . . . Write now for Bulletin No. 41, showing types and sizes best fitted to your requirements.

DETROIT STAMPING CO.
Established Over 25 Years
344 Midland Ave • Detroit, Mich.



Dramatic trip hammer "wear-test" fails to break down the smooth, accurate striking surface of Chicago Rawhide Hammer.

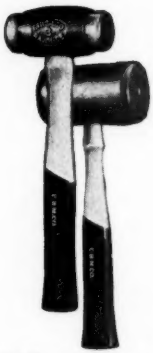
After 10,000 blows with a free falling 25 lb. weight striking crushing blows simultaneously on both faces of a Chicago Rawhide Hammer—there was still a smooth, accurate stiking surface.

The genuine Java Water Buffalo hide faces had worn off 1/8" (less than one-quarter of the usable surface of hammer inserts). Even these solid steel knurled faced hammers, dropping 19" at 45°, had done nothing more than wear the surfaces.

Your interest in this test is this:

Chicago Rawhide Hammers and Mallets, which strike hard blows softly without damage, can take hard blows indefinitely without damage. Q. E. D.

These economical long wearing tools are made in sizes and weights to meet every need. Insist on genuine Chicago Rawhide Hammers and Mallets.



CHICAGO RAWHIDE MFG. CO.

1280 Elston Avenue
Chicago, Illinois

Use of X-rays for Non-Destructive Inspection of Metals

(Continued from Page 38)

Application of X-ray examination of welds has resulted in great improvement in the quality of welded joints. Defects resulting from entrapped slag, porosity, incomplete fusion and cracks are clearly visible on the X-ray film. In welds, as in castings, the examination reveals the presence and nature of internal defects not discernible on the surface. As the X-ray beam passes through the material, it produces a shadow picture of the specimen. Variation in the shadow intensity indicates lack of uniformity in the material, and the cause of the non-uniformity can be deduced. Flaws amounting to as little as 2 percent of the total thickness—even as little as one-half of one percent in favorable cases—can be detected.

Figure 6 shows three welds, each apparently perfect in surface appearance, yet the middle film obviously shows an area of poor fusion which may result in failure in service. If the weld had been examined by sectioning, the defect might have been missed and the welding process would have been called satisfactory. The X-ray beam showed that the process was not adequate, and a change in technic was made which produced the perfect weld shown on the right.

It is very clear that X-ray equipment is rapidly becoming essential in the metal working industry—its value in detecting flaws, elimination of machining or imperfect materials and parts, and its ability to test and determine close limits of grain structure under cold working and annealing, assure such equipment a definite place in this industry.

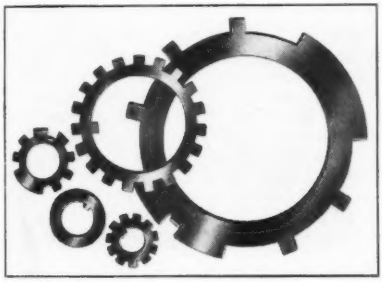
Timken Co. Transfers Lindus to Canton

The Timken Roller Bearing Company, Canton, O., announces the transfer of F. H. Lindus from manager of the Los Angeles branch to sales promotion work at Canton. Mr. Lindus has been with the Timken Company since 1935.

Dayton Rogers Announces Special Washer Service

THE Victory Program has created an increasing demand for special custom made lock washers, including thrust washers in various sheet alloys. The Dayton Rogers Manufacturing Co., Minneapolis, Minn., by means of a special die stamping process, has been able to produce 100 special custom made stamped lock washers or thrust washers according to definite requirements at a cost comparable to that of 6 or 8 hand made washers.

The present capacity ranges in size from ½" to 12" in diameter of any sheet alloy that will lend itself to the conventional type of die stamping of sheet metal parts. This new service is of considerable advantage to the machine tool trade, as well as other machinery equipment manufacturers.



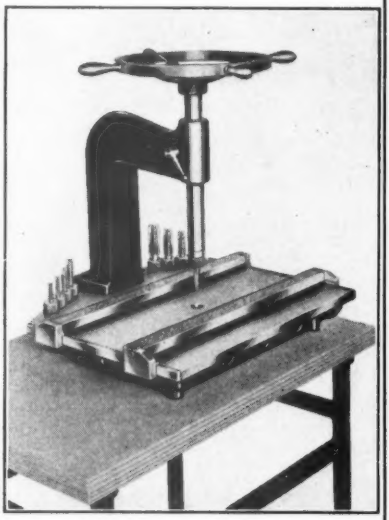
All these lock washers and thrust washers are produced on a special compound die of exclusive design. The Company states that the representative samples may be had on request.

Complete information, including a detailing of the technique of the special stamping process to produce lock and thrust washers, is available in a new catalog. For your copy, write Dayton Rogers Mfg. Co., 2830 13th Ave. S., Minneapolis Minn.

Jessop Appoints Bingman

JESSOP Steel Company, 610 Green St., Washington, Pa., has announced the appointment of R. E. Bingman as District Manager for the Indiana territory, with headquarters at 617 Architects and Builders Bldg., Indianapolis, Ind.

THE VIKING
REG. TRADE MARK
TAPPER

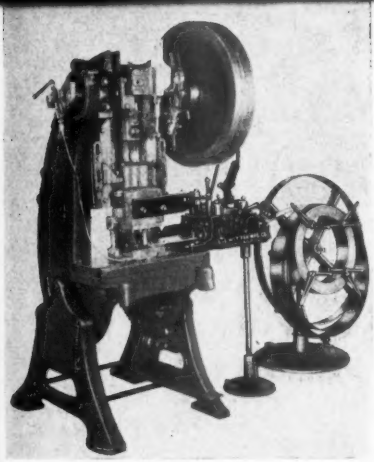


A PRECISION BUILT TOOL

Base, semi-steel casting, well ribbed and seasoned to prevent warping.
Two sliding parallel bars to hold work in place while tapping.
Quick changing adaptors, requiring but 5 seconds to change tap.
Steel spindle hardened, ground and lapped to a perfect gage fit.
Spindle lock for holding spindle in position.
Two spindle bearing bushings hardened, ground and lapped.
Aluminum handwheel with four inserted steel handles.
Bracket arm, semi-steel casting bottom scraped to insure spindle is perfectly square with base.

Send for Circular

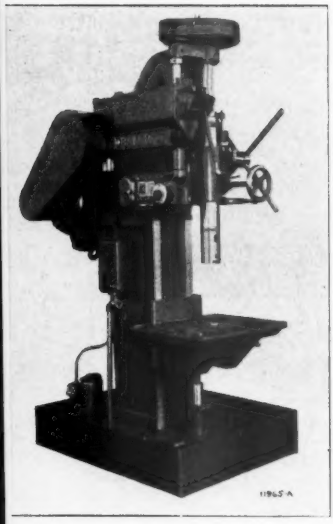
THE VIKING TOOL & MACHINE CORP.
6 Main St. Belleville, N. J.



PROGRESSn

The Wittek Model 6L Automatic Roll Feed and Model 3B Reel Stand, manufactured by the Wittek Manufacturing Co., 4305 W. 24th Place, Chicago, Ill., are designed for rapid, smooth and accurate feeding for punch press operation. The rolls of the feed turn constantly, while the forward movement of the stock is arrested momentarily by release of the rolls to allow for stamping operation and ejecting of the stamped part. Power for driving the feed is transmitted by chain from a sprocket mounted on the crank shaft of the press to a sprocket on the drive shaft of the feed. Adjustable chain tightener takes up the slack and permits the use of interchangeable sprockets for any desired ratio between the press and the feed. Single, double, compound, reversible and special roll feeds are illustrated in Bulletin WF 339 which is available on request.

•

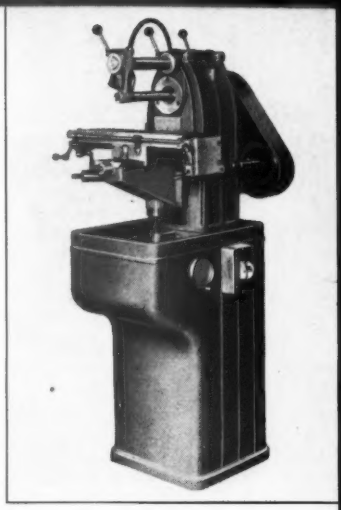


Baker Brothers, Inc., Dept. J, Toledo. O., recently announced their new model No. 314A Single Spindle Universal Quick-Change Type Heavy Duty Drilling Machine having a 3" diameter drill capacity in solid steel. In addition to drilling, the machine is also particularly adapted to boring, counterboring, facing, forming and tapping operations. The spindle is of forged high-carbon steel with a spindle nose carrying a No. 5 Morse Taper. Six speed changes are provided by means of sliding hardened gears. Complete operating details are included in Circular No. 1000.

•

An important step in manufacturing "American Swiss" files is cutting the teeth. Some are chisel-cut by machines but others are cut by a process called etching, requiring a special etching tool developed by American Swiss File and Tool Company. This process requires a high degree of skill and the men engaged in this work have had considerable experience. As a result of this skill and accurate equipment a uniform degree of hardness is obtained by a special annealing process; each file has a remarkably sharp, even teeth of equal depth and regularity. A catalog illustrating some 3,000 styles and shapes of files will be sent on request made to American Swiss File and Tool Co., 412 Trumbull St., Elizabeth, N. J.

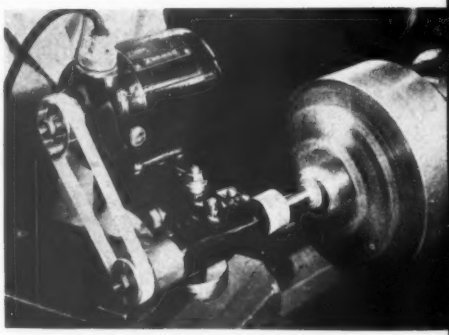
SSn PARADE



The Jackson No. 1 Horizontal Milling Machine designed for both tool room and production work is being produced by Jackson Machine and Tool Co., 956 Roberts St., Jackson, Mich. The new machine is rigidly constructed throughout and has a variable speed range up to 3000 rpm. The mill, with a ½" cutter capacity, will handle ⅜" cut ¾" deep in solid steel at one cut. A recently enlarged plant has stepped up the production of the mill. Complete information is available.

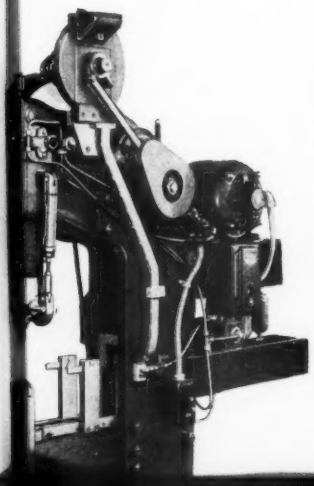
●

The "Toolmaker" is a precision tool room grinder manufactured by The Dumore Company, Dept. 372-A, Racine, Wisc. Speeds from 6,600 to 38,500 rpm are provided by a ¼ hp Dumore Universal Motor. Preloaded bearings are mounted in the end caps close to the work providing precision grinding accurate to one tenth (.0001"). To convert the No. 44 from an external grinder to one for internal work is simply a matter of screwing either an extension spindle or a collet chuck on the shaft depending on whether a small straight or mounted wheel is to be used. Bulletin T gives complete details and illustrates numerous tool room applications.



●

The new model "RK" Rivitor has been developed by the Tomkins-Johnson Co., 630 N. Mechanic St., Jackson, Mich. It pierces and rivets automatically the unpierced work, driven down over the underfed rivet punching a slug out of the work. The rivet is then set at the next stroke of the machine. The unit handles rivets in sizes up to 1.40 diameter x ¼" long unannealed solid steel rivets.



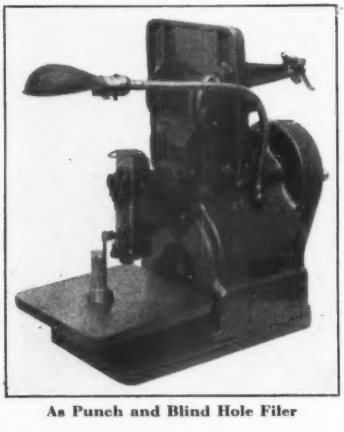
●

The illustration at right shows the Simplex-M-6 Abrasive Band Grinder manufactured by the Walls Sales Corp., 97 Warren St., New York, N. Y. A ¾ hp motor and a fully enclosed V-belt drive on balanced steel pulleys provide smooth, trouble-free operation. The band tension is automatically controlled by a positive acting tension spring arrangement. The machine is particularly valuable for increasing production. Complete specifications and operating data are available.

New DUPLEX Die and Punch Filing Machine

As Die Filer

The exclusive double-purpose tool with adjustable stroke from 0 to 1½". This machine files dies in the conventional way on *upper* table and punches with heels, flanges or *blind* holes on *lower* table from above by tilting upper table out of way.



As Punch and Blind Hole Filer

Get one today while we can deliver promptly

MARBURG BROS. INC.
92 WEST STREET NEW YORK

Additional DCD Offices and Address Changes to Date

The following field offices of the Division of Contract Distribution, OPM, are in addition to those published previously. They include a number of new offices:

Albuquerque, N. M.
103½ W. Central Ave.

Allentown, Pa.
506 Hamilton St.

Bangor, Me.
363 Union St.

Bismark, N. D.
14 First National Bank Bldg.

Boise, Ia.
409 Capital Securities Bldg.

Brooklyn, N. Y.
16 Court St.

Casper Wyo.
P and R Bldg.

Charleston, W. Va.
Cor. Capital & Quarrier Sts.

Chester, Pa.
12-14 E. Fifth St.

Des Moines, Ia.
505 Crocker Bldg.

Duluth, Minn.
416 Federal Bldg.

Eau Claire, Wis.
128½ Graham Ave.

Fort Wayne, Ind.
410 Utility Bldg.

Grand Rapids, Mich.
1004 Michigan Natl. Bank Bldg.

Fresno, Cal.
Mattei Bldg.

Johnstown, Pa.
U. S. National Bank Bldg.

Lowell, Mass.
Sun Bldg., 8 Merrimac St.

Madison, Wis.
405 Washington Bldg.

Milwaukee, Wis.
610 First Wisconsin National Bank Bldg.

Newark, N. J.
176 Sussex Ave.

Oakland, Cal.
Financial Center Bldg.

Sacramento, Cal.
Farmer's & Mechanic's Bldg.

San Diego, Cal.
309-310 Boyce Greely Bldg.

Scranton, Pa.
Room 717, First National Bank Bldg.

Sioux Falls, S. D.
309-310 Boyce Greely Bldg.

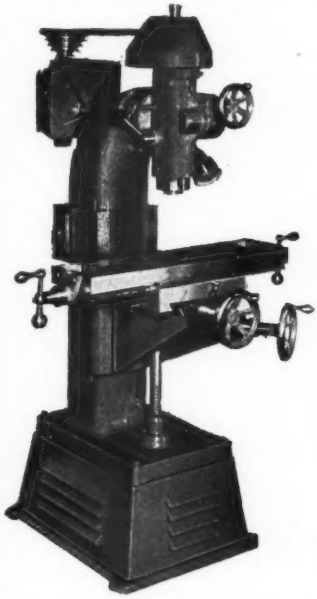
South Bend, Ind.
112 W. Jefferson Bldg.

Syracuse, N. Y.
302 Starrett-Syracuse Bldg.

Tampa, Fla.
901 Wallace S. Bldg.

Tulsa, Okla.

Wichita, Kan.
517-518 Union National Bank Bldg.



Our Prompt Deliveries are Helping to Speed the

DEFENSE PROGRAM

Jackson No. 2
Vertical High Speed

Milling Machines

A new plant with increased facilities has made it possible for us to accept a limited number of orders for prompt shipment. High Grade in every respect and especially designed for High Speed Precision and Production Milling and Boring.

Wire, Phone or Write

Jackson Machine & Tool Company Sales Division
956 Roberts St. Jackson, Michigan

Williamsport, Pa.
Susquehanna Trust Co. Bldg.

The following field offices are those that have moved since we printed the first notice of their establishment:

Atlanta, Ga.
Suite 150, Hurt Bldg.

Baltimore, Md.
1254 Baltimore Trust Bldg.

Birmingham, Ala.
1706 Second Ave., N.

Boston, Mass.
17 Court St.

Bridgeport, Conn.
144 Golden Hill St.

Chicago, Ill.
20 North Wacker Dr.

Cleveland, O.
Union Commerce Bldg.

Dallas, Texas
Fidelity Bldg.

El Paso, Texas
222 El Paso National Bldg.

Louisville, Ky.
200 Todd Bldg.

Los Angeles, Cal.
1031 S. Broadway

Memphis, Tenn.
2112 Sterick Bldg.

Minneapolis, Minn.
326 Midland Bldg.

Nashville, Tenn.
1014 Stahlman Bldg.

Newark, N. J.
20 Washington Place

New Orleans, La.
Room 423, Canal Bldg.

New York, N. Y.
122 E. 42nd St.

Oklahoma City, Okla.
540 Key Bldg.

Omaha, Neb.
501 Grain Exchange Bldg.

Philadelphia, Pa.
1617 Pennsylvania Blvd.

Pittsburgh, Pa.
406 Fulton Bldg.

Portland, Ore.
815 Bedell Bldg.

Richmond, Va.
Johnson Publishing Bldg.

Salt Lake City, Utah
432 Utah Oil Bldg.

San Antonio, Texas
1100 S. Texas Bank Bldg.

San Francisco, Cal.
1355 Market St.

Seattle, Wash.
3314 White Bldg.

Springfield, Ill.
407 Leland Office Bldg.

Wilkes-Barre, Pa.
53 West Market St.

Metal Duplicating Without Dies

by New "DI-ACRO" System

A REMARKABLY versatile and flexible method of making small metal parts in limited quantities is made possible by the use of the "DI-ACRO" Bender, Brake and Shear. These precision machines do the work rapidly and are accurate to .001".

The illustrations show the three typical steps in this process. First, the man at the right is cutting strips from a stock sheet to the required size with the "DI-ACRO" Shear. Second, the operator in the center is forming a channel from the accurately sized strip with the Brake. Third, the last man is putting a bend on each end of the channel with the "DI-ACRO" Bender.

These bends can be of varying radii, and the two bends are shown on opposite sides of the channel, one with the channel turned out and one with the channel turned in. The finished piece (see close-up view of the three steps) represents a composite of many accurately formed parts found in small electrical and mechanical assemblies and manufacturing processes.

These three machines comprise a system of almost unlimited possibilities for metal duplicating without dies, yet retaining die accuracy. The Bender also handles round, half-round, square or flat wire, round or square tube, rod, etc. All the machines are adapted for either right or left hand operation.

For full details on the possibilities of Metal Duplicating without Dies by the use of "DI-ACRO" machines, write the O'Neil-Irwin Mfg. Co., 315 8th Ave. S., Minneapolis, Minn.

Write for descriptive folder TD Circulars available on Tail-Stock and Tool-Post Turrets, Endless Belt Sander, Swing Frame Grinder and Foundry Riddle.

"BULL DOG" MODEL

JEFFERSON

Motor Driven Precision

MILLING MACHINE

(Floor or Bench Type, Power Feed or Quick Acting Hand Feed)

The Jefferson Milling Machine is capable of close tolerance . . . proved performance for such operations as die sinking, contour profiling, angular milling, jig boring, routing of ferrous and non-ferrous metals and practically all other essential milling operations for production line or tool room.

The working surface (14" x 4⅜") of the table of the Jefferson Milling Machine has an equal capacity to that of many larger and much higher priced machines and is equipped with three T slots to accommodate standard T bolts for tightly clamping of work or fixtures. Four spindle speeds, 200, 400, 700, 1000 rpm.

It is so constructed that it is at all times ready for the application of a variety of standard attachments.

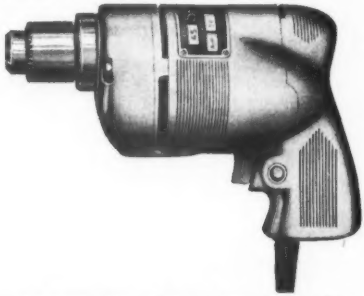
JEFFERSON MACHINE TOOL CO.

710 N. W. Fourth Street
Cincinnati, Ohio

Skilsaw, Inc., Announces New ¼-in. Skildrill

THE new Skildrill, a ¼-inch drill, particularly suited for fast production drilling because of its compactness, light weight, perfect balance and ready power, has been introduced by Skilsaw, Inc., Chicago, Ill. The Skildrill weight of 2¾ pounds, width of 2⅛" and overall length of 6⅝" assures a comfortable fit in the operator's hand for drilling in the tightest spots. Its ease of handling makes it a perfect drill for all production work in aircraft, tank, automobile, refrigerator and other industrial fabrication.

The Skildrill has a no-load speed of 1800 rpm and a full-load speed of 1050 rpm. Drilling capacity in steel is ¼" and in hardwood ½". Other of its unique design features include a die-cast body for great strength and minimum weight; complete anti-friction ball and needle roller bearings; and helical-cut gearing throughout.



Skilsaw, Inc., 5033 Elston Ave., Chicago, Ill., will gladly send literature and further details at your request.

Recent Industry Publications

DOUGLAS PRECISION SLOTTER — Description, illustrations and dimensions of the Douglas Precision Slotter are attractively shown in a new two color, eight page Slotter Bulletin. The Douglas Slotter is adaptable to both tool room and production work. Its universal usefulness results from the vertical design and swivelling ram head and toolholder. Automatic circular table with independent automatic feeds in all directions, accurate operation of ram brake and easily adjustable stroke are other features. Address requests for this Bulletin to Douglas Machinery Co., Inc., 150 Broadway, New York, N. Y., Dept. 80-6.

RED-E-TOOLS—The Ready Tool Co., 553 Iranistan Ave., Bridgeport, Conn., have available their latest Catalog No. 41 giving prices, illustrations and specifications of Red-E High Speed Steel Lathe and Grinder Centers, Ball Bearing Centers, Tool Holders, Machine Dogs and Boring Bars. This 28-page handy catalog is planned for quick reference. Requests for Catalog No. 41 should be addressed as shown above to the attention of Box TD.

DYKEM STEEL BLUE PREVENTS METAL GLARE—Circular No. 20141 explains how Dykem Steel Blue eliminates eye strain for laying out dies, templates, etc. Easily applied, quick drying and uniform in thickness, Dykem Steel Blue does fast, accurate work. For your copy of Circular No. 20141, write The Dykem Co., 2201 N. Eleventh St., St. Louis, Mo.

WILLEY'S CARBIDE TOOL—Catalog No. 25 describes and illustrates by photographs and diagrams the standard tools, standard blanks, carbide grinders and many other products manufactured by the Willey's Carbide Tool Co., Detroit, Mich. A table listing the grades and classifications of Willey's metals and several condensed tables for computing gram weights of Willey's tips will prove of value and interest. Catalog No. 25 will be sent promptly at your request by Willey's Carbide Tool Co., 1343 W. Vernor Highway, Detroit, Mich.

CAPEWELL METAL CUTTING SAW BLADES—Capewell Mfg. Co.'s new catalog M2390 conforms with the recent recommendation of OPM on types and sizes of Metal Cutting Saw Blades. Of special interest are the sections devoted to useful information for the users of hack saw blades and band saw blades. Suggestions to make metal saw blades last longer in actual service are given. Direct your request for Catalog M2390 to Capewell Mfg. Co., Dept. CM-1, Hartford, Conn.

FLEXIBLE SHAFT MACHINES—The complete line of flexible shaft machines of the Mall Tool Company, 7740 S. Chicago Ave., Chicago, Ill., is described in their industrial equipment catalog. Over fifty pages are devoted to specifications and applications of Flexible Shaft Machines. With a one-power unit a multitude of jobs are handled ranging from sanding and polishing to drilling, grinding and operating rotary files. For easy reference a complete list of attachments for each machine giving both part number and price are included. Address request for this catalog to Mall Tool Co.

DIE SPRING BULLETIN—A new die spring Bulletin has just been published by the Muelhausen Spring Corporation, Logansport, Ind. The new 8½" x 11" four-color Bulletin illustrates, describes and prices die springs for high speed presses, regular speed presses, and heavy duty presses. Printed on heavy card stock for convenient filing, all die spring information is presented in a condensed tabular style easy to understand. Copies are available without charge by writing to the company and mentioning this magazine.

STUDEBAKER HYDRAULIC VISEPRESS—Designed for production, tool room and maintenance use in tool rooms and manufacturing plants. The Studebaker Machine Co., 9 S. Clinton St., Chicago, Ill., has available a 3 color, six-page folder describing in detail the operation of Studebaker Hydraulic Visepresses and showing a number of applications. A maximum pressure up to five tons on the center of the jaws is exerted by a Booster Pedal.

LOW TEMPERATURE WELDING—A new Technical Data Book issued by Eutectic Welding Alloys, Inc., New York, N. Y., not only gives a complete description of all new alloy rods, but gives important information for fabricating machined parts, replacing castings, forgings and stampings. It discusses salvaging work on defective castings as well as aluminum, bronze, nickel, nickel silver, malleable iron, alloyed steel and cast iron. The new Castolin Eutectic Low Temperature Welding Process is fully described. This 32-page Data Book has many useful illustrations. Send for your copy. Address Eutectic Welding Alloys, Inc., Dept. T, 40 Worth St., New York, N. Y.

ROAN TOOL AND CUTTER GRINDER—is described and illustrated in new Bulletin R-J. The grinder is a combination of fixtures which enables users to grind and sharpen all types of metal working tools as well as do contour and surface grinding. Complete specifications are given. Address Roan Mfg. Co., 1222 Washington Ave., Racine, Wis., for your copy of Bulletin R-J.

MULTIPLE SPINDLE DRILLING AND TAPPING HEADS—Bulletin No. 3, second edition, by the Ettco Tool Co., 592 Johnson Ave., Brooklyn, N. Y., describes standard drilling and tapping heads available for multiple drilling and tapping operations. Ettco Tool Co. also has a complete catalog covering Tapping Attachments, Foot Operated Tapping Machines, Motor Driven Tapping Devices and Ettco Drill Chucks. For Bulletin No. 3 or the complete catalog, write Ettco Tool Co.

MACHINIST TOOLS—J. H. Williams & Co. announce their new Machinists Tools Catalog. The 32 pages are packed with essential buying information. As an example: the "C" clamp section lists part number, capacity (maximum and minimum), depth of throat from center of screw, extreme dimensions of body, screw, approximate weight and prices. To secure this catalog write to J. H. Williams & Co., 441 Vulcan St., Dept. J-1, Buffalo, N. Y.

(Continued on Page 74)

Continental Issues New Attachment Folder

THE Attachment Catalog, issued by Continental Machines, Inc., Minneapolis, Minn., contains twenty-one basic attachments which are essential to get every advantage out of the increased speed and cutting performance of the DoAll Contour Sawing Machines.

The necessity of following lines to close tolerances in speeded War production resulted in the DoAll magnifying attachment, which has an enclosed light permitting the use of both eyes to see the layout lines at the point of work without glare. The glass magnifies the work line two fold and is adjustable to any sawing, filing or polishing operation.

The disc cutting attachment, employing manual or power feeds, assures the sawing, filing or polishing of true circles either internal or external of any diameter from 2½" to 30".

The development of the hydraulic contour feed control now permits the power feeding along any contour, including circles of diameters as low as four inches. Formerly hydraulic and automatic feeds were confined to the cutting of straight or near straight lines. This feed is controlled by a hand wheel.

With the application of 30 degree angle saw guides in place of regular guides the DoAll operator may cut long rods, tubes and bars which are longer than the normal throat capacity of the machine.

These and many other attachments for reducing cutting costs and saving materials are discussed in this catalog. Complete details and illustrations cover each attachment. Copies of the new Attachment Catalog will be sent at your request by Continental Machines, Inc., 1303 S. Washington Ave., Minneapolis, Minn.

Carboloy Reduces Prices

WITH completion of its second plant expansion in six months, Carboloy Co., Inc., Detroit, has announced its second price reduction, effective January 1, on standard tools and tips since these were developed by Carboloy and put in mass production only a little over a year ago. This latest expansion has been designed to provide greater productive capacity for carbide metals and tool tips, by converting a great percentage of its cutting tool and tip business from "specials" to "standards." The price reductions, therefore, anticipate an expected increase in total Carboloy tool output.

WE'VE GROWN

6½ TIMES BIGGER

SINCE 1935!

There's basic business virtue in building a better product or we couldn't have increased our plant space 6½ times since 1935. Universal drill bushings have superfinished bores straight and round within .0001 assuring accuracy and unexcelled wearing qualities. Black domes resist rust and improve appearance. All standard sizes available for speedy delivery. Write for facts.

UNIVERSAL

Engineering Company

Frankenmuth, Mich.

Recent Industry Publications

(Continued from Page 72)

MEEHANITE CASTINGS IN DEFENSE WORK—A new 12-page Bulletin, just published by the Meehanite Research Institute of America, Inc., 311 Ross St., Pittsburgh, Pa., describes and illustrates Meehanite castings used in aircraft manufacture, gun and shell manufacture, machine tool castings and radio, marine, truck and steel mill equipment. The Bulletin is well illustrated with actual shop photographs. A copy of "Meehanite Castings in Defense Work" will be sent at your request by the Meehanite Research Institute.

ILLINOIS GEAR MEASURING BLOCKS—Designed to eliminate the difficulties previously encountered by old methods of measurement, provide the gear manufacturer with the simplest and most accurate means of checking the tooth thickness and pitch diameter of finished gears. These blocks are in effect theoretical rack teeth of known proportions because they are made to the exact pitch and pressure angle of the gears to be measured. Folder TW-12 gives an interesting example for figuring block measurement and contains interesting diagrams. The Illinois Tool Works, 2503 N. Keeler Ave., Chicago, Ill., will be glad to send a copy of Folder TW-12 at your request.

JOHNSON METAL CUTTING BAND SAW—Bulletin JM, issued by Johnson Machine Works, Inc., Albion, Mich., describes and illustrates the Johnson Band Saw which is designed for cutting off strips, bars or odd shapes quickly and accurately. The Johnson Band Saw numbers among its outstanding advantages its rigid box-type frame, improved hydraulic control and large capacity, which enables it to handle 10" rounds or 18" flats. General specifications are given. Address Johnson Machine Works, Inc., for your copy of Bulletin JM.

AMPCO METAL—Ampco Metal, Inc., has issued a series of Bulletins covering the use of Ampco Metal in machine tools, in aircraft, in dies, in bushings and bearings, in gears and in centrifugal casting. Ampco Metal, which is made in six grades of graduated physical properties and as-cast Brinell hardness, has been the solution of so many difficult applications in the past that this series of bulletins comes as a timely aid in our present Victory program. A wealth of material has been collected in these bulletins which can be obtained by writing to Ampco Metal, Inc., 1741 S. Thirty-Eighth St., Milwaukee, Wis.

PALNUT "DOUBLE-LOCKING ACTION"—A new twelve-page manual describing in detail the "Palnut" Locknut which has been used for 15 years as standard equipment on many Army, Navy and air line engines. Such advantages as a double locking action, security against vibration, fast assembly and low cost are all amply illustrated and explained. The Palnut Co., 63 Cordier St., Irvington, N. J., will gladly send this manual upon request.

UNIVERSAL SLOTMASTER—A double duty slotting head which can be used as a vertical slotter and shaper for cutting key-ways, templates, splines, internal gears, and for slotting out precision blanking dies and molds, or wherever sharp corners and special shapes are machined. The Experimental Tool & Die Co., 12609 Greiner Ave., Detroit, Mich., has available a four-page illustrated circular describing the Slotmaster's capabilities and its adaptability to all milling machines.

INSPECTOGRAPH—Bulletin No. 18, recently issued by Schultz & Anderson Co., 176 Ferry St., Newark, N. J., describes a wide and varied use for the Inspectograph, i.e., sharpening tool bits, reamers, and milling cutters—accurate micrometer readings—laying out fine work—inspecting screw machine products, gun parts, gages, taps and castings. The company offers a ten-day free trial period. For further detailed information send for Bulletin No. 18.

GERSTNER TOOL CASES AND CHESTS—H. Gerstner & Sons, 56 Columbia St., Dayton, O., have just released a new price list with pictures of the latest tool cases and chests for tool and die makers. A wide selection of styles are offered in both quartered oak finish or in art leather covering. Upon request, Gerstner & Sons will supply these price lists.

THE HARTFORD "SUPER-SPACER"—Bulletin No. S-101, the new two color, eight-page layout devoted entirely to a wide range of typical setups possible with the "Super-Spacer". Here is a Bulletin of real value to the tool room pushing Victory Program work. With attachments and fixtures, are also shown operations of drilling, grinding, jig boring and slotting. Direct all requests for Bulletin No. S-101 to the Hartford Special Machinery Co., 281 Homestead Ave., Hartford, Conn.

KARELSEN DIAMOND SHAPED TOOLS—Specially shaped and mounted in tools for turning and cutting can be used on such materials as hard rubber, plastics, mica and non-ferrous metals. The shaped tools are cut and set with specially designed accurate equipment exactly to customer's specifications. All Karelsen tools are project tested to insure accuracy. Further information and description sheet will be sent by E. Karelsen, Inc., 54 W. 45th St., New York.

VASCOLOY-RAMET CATALOG—The new, completely revised general catalog and price list of Vascoloy-Ramet Tantalum-Tungsten Carbide Tools and Blanks is now available. Included are 22 typical styles of single point tools, instructions for ordering tools and blanks, tables for computing costs of standard tools and blanks and special blades. Also included is a grade selector chart giving recommended uses for the various grades of Vascoloy-Ramet. For your copy of the new catalog write Vascoloy-Ramet Corp., Dept. TD, North Chicago, Ill.

MOTOR DRIVEN MACHINES—A new 6-page folder, issued by the Burke Machine Tool Co., Conneaut, O., describes and illustrates the 5 milling machines to their line, which are adaptable for the rapid handling of small parts. A separate sheet, perforated for easy filing, is a combined price List and Specifications Sheet for the 5 milling machines and their attachments. A copy of Form BM, with separate Price List and Specifications Sheet, will be sent at your request.

adjustable "cushioned" air cylinder strokes

T-J CUSHIONED AIR CYLINDER
(shown in section)

Complete specifications of Cushioned and Non-Cushioned types are shown in our Catalog 36-A2. Your copy will be sent promptly. Address The Tomkins-Johnson Co., 630 N. Mechanic Street, Jackson, Mich.

The action of the cushioned part of an air cylinder stroke depends on variables that are, at best, difficult to determine. This condition can be offset in part by having this cushion action adjustable. Cushion adjusting screws operate to "slow" or increase the speed of the cushion action.

Furnished as standard equipment on T-J Cushioned Air Cylinders,* these screws may be readily *adjusted and locked in position on the job.

this is a **TOMKINS-JOHNSON** *product*

DCD Opens Exhibits for Subcontractors

A NUMBER of permanent exhibits of sample pieces of defense equipment and parts are being prepared by the Division of Contract Distribution for the information and guidance of actual and prospective subcontractors. Exhibits will be furnished by prime contractors, actual pieces shown changing from time to time as subcontracting progresses and as different requirements dictate. The first "department store of subcontracting" has already been opened—the St. Louis exhibit opened on December 23 on the eighth floor of the Boatmen's Bank Building.

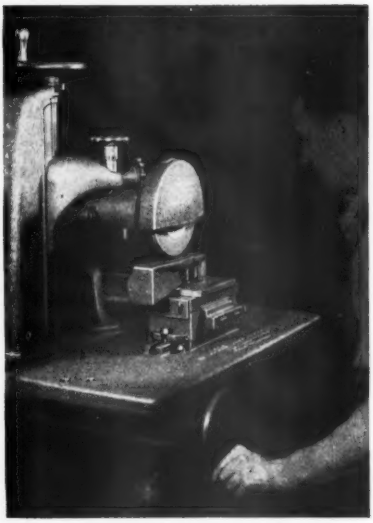
Other exhibits scheduled to be open in January include:

Atlanta—Hurt Bldg.
Chicago—Civic Opera Bldg.
Cleveland—Union Commerce Bldg.
Detroit—Boulevard Bldg., Grand Blvd. and Woodward Ave.
Los Angeles—Western Pacific Bldg.
New York—Chanin Bldg., 122 E. 42nd St.
Philadelphia—Broad St. Station Bldg.

These exhibits are in addition to the displays of weapons, ammunition, fire control instruments and other ordnance items at each of the 13 Ordnance District offices. Prospective subcontractors of these classes of items can get complete information at such offices.

War Production Pool Clearance by DCD Offices

FLOYD B. ODLUM, director of Division of Contract Distribution, OPM, announces that an arrangement with Thurman Arnold, Assistant Attorney General of the Department of Justice, to expedite legal clearance of proposed war production associations has been made. Groups of local manufacturers, planning such working pools, can now get assistance on organization plans from their nearest DCD field office. The plan is for local groups in the area from Chicago to the West Coast. In this area such proposed organizations will be cleared by local DCD offices with field offices of the Antitrust Division. In the area east of Chicago, plans for proposed associations or pools will be passed upon by the Department of Justice.



BUILDERS
"T" SURFACE GRINDER

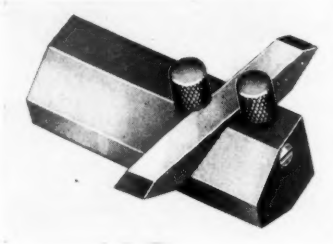
"We can do SMALL TOOL AND DIE GRINDING CHEAPER ON THIS MACHINE than on our large automatics which not only require greater set-up time but, due to over-travel and less flexibility, longer grinding time, too." That, in essence, is what users tell us. Machines are moderately priced, so that it pays to install them at points convenient to the men who frequently have small grinding to do.

SEND FOR BULLETIN 644

BUILDERS IRON FOUNDRY
23 Codding Street
PROVIDENCE RHODE ISLAND

New Acro Master Gage

THE Acro Tool and Die Works, Chicago, Ill., have announced their new Holder Gage, a master gage for holding thread cutting tools at proper angles on the grinding surface as required for standard thread cutting operations. The gage consists of a one-piece, hardened steel base, milled and slotted to position. The tool bit is held down tightly within the slot by means of two knurled head screws. A set screw takes up any lateral motion which may occur.



The gage is said to be fool-proof, assuring greater accuracy in the grinding of thread cuttings tools than possible to obtain by grinding free hand. The manufacturer states that the new unit departs from conventional gages in that continuous testing is unnecessary. Regrinding is practically eliminated because grinding operations are limited to fixed angles, insuring uniformity of grind.

Complete details and new descriptive literature on the New Acro Holder Gage are available at your request. Address Acro Tool and Die Works, Dept. TD, 2815 Montrose Ave., Chicago, Ill.

McKenna Reduces Prices

McKENNA Metals Co., 500 Lloyd Ave., Latrobe, Pa., announce a price reduction in Kennametal Tools and Tool Blanks effective January 5. The prices of complete Kennametal tools with Kennametal tips brazed on steel shanks have also been reduced.

A new price list, No. 7, covering prices of Kennametal Tools and Tool Blanks listed in Catalog No. 42 is obtainable on application to McKenna Metals Co.

New Majestic Internal Grinding Machine

Designed to meet the requirements of most tool room internal grinding operations.

Equipped with Parker spindle and motor. The nose of the hollow spindle is ground for use of collets—with outside threaded for adaptors and a face plate. Parker ball bearings and standard rotor and stator assure perfect balance for smooth spindle movement. Parker spindle is available in several sizes.

Work head is readily adjustable, with graduated base which swivels 90 degrees on each side of center for taper grinding. A three step V-belt pulley drives an intermediate three step pulley on adjustable countershaft, which, in turn, has a V-belt drive to the main spindle.

The Majestic Internal Grinder is furnished with two section type table, mounted diamond dresser, and coolant tank designed for filtering and equipped with a ⅛ HP motor driven centrifugal pump.

Write for new descriptive circular.

2946 Woodbridge St., E.
Detroit Michigan

MAJESTIC TOOL & MANUFACTURING CO.

New Hy-Mac Bulletin Issued

HYDRAULIC Machinery, Inc., Detroit, Mich., has issued an illustrated Bulletin, "Hydraulic Machines and Power Units", showing a number of applications of the Hy-Mac power units built by this company. Applications include a bending machine for light forming work, testing unit for aircraft engine cylinder heads, automatic welder and torque tube spotfacing machine. These units, which can be built into newly designed machines or applied to present machine tools, are extremely flexible and can be arranged to provide any thrust and sequence of motion, any feed or traverse rate, any acceleration or deceleration and any rpm. The Bulletin gives engineering data.

For a copy of "Hydraulic Machines and Power Units", write Hydraulic Machinery, Inc., 9371 American Ave., Detroit, Mich.

Duro Power Tool Catalog

DURO Metal Products Company, Chicago, Ill., has issued their new Catalog E-41-B, "Duro Power Tools." This 56-page catalog covers in comprehensive detail the drill presses, band saws, lathes, grinders, sanders, jointers and other equipment made by this company. The catalog is exceptionally well illustrated, with many photographs of design features. The accessories for all machines built by the company are also illustrated and described. A Price List is included with the catalog.

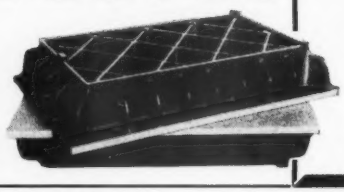
Catalog E-41-B and Price List will be sent promptly by Duro Metal Products Co., Dept TP-13, 2649 N. Kildare, Chicago, Ill.

Butterfield Tap and Die Catalog is Unusually Complete

BUTTERFIELD Division, Union Twist Drill Co., Derby Line, Vt., manufacturers of taps, dies, screw plates and reamers, offer an unusually complete Catalog (No. 22). Standard and special hand and machine taps, the well-known THRED-RITE dies and holders, spring screw, adjustable round and adjustable round split dies, hexagon rethreading and solid square pipe dies are

(Continued on next Page)

REID MASTER PLATES



A NECESSITY IN EVERY PLANT WHERE ACCURACY IS DESIRED

THOROUGHLY normalized, weather seasoned, planed and scraped on same 3-point bearing on which they rest in use, and guaranteed accuracy within .0003 on a 24" x 36" size. Available in standard sizes 12" x 18" to 36" x 72". Planed and scraped.

TOOL ENGINEERING SERVICE COMPANY, INC.

245 Washington Ave. Nutley, N. J.

Butterfield Tap and Die Catalog

(Continued from Page 77)

illustrated, sized and priced. Several lines of screw plates are shown.

A complete line of reamers—both precision and commercial grades—are shown in another section. There is also a section index containing over 50 Tap and Die Tables, Comparative Chart of Limiting Pitch Diameters for Gages, Hardness Conversion Table and Decimal Equivalents.

For your copy of Butterfield Tap and Die Catalog No. 22, address Butterfield Division, Union Twist Drill Co., Dept. TD, Derby Line, Vt.

New B&W Boring Bar Holder

THE new B&W boring bar holder, offered by B&W Manufacturing Company, El Monte, Calif., incorporates several features that will appeal to the shop man. The bar holder, made in 9 sizes, is a solid one-piece type with a very accurately broached hole. Graduations on the bars eliminate need for file or chalk marks. The holder instantly centers and clamps any size boring bar without disturbing the holder alignment.

For circular write B&W Mfg. Co., 3217 Double Drive, El Monte, Cal.

Dies Tools Gages Jigs

Aircraft Parts Fixtures

Special Machines

Capacities now open for

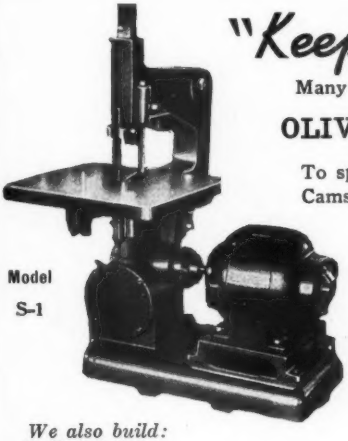
HORIZONTAL BORING MILL

STAR MACHINE & TOOL CO.

9320 WOODLAND AVE. CLEVELAND, OHIO

Detroit Representative:

J. O. Stephenson MAdison 6067 2867 E. Grand Blvd.



Model S-1

We also build:
Drill Grinders—
Cutter Grinders—
Tool Bit Grinders

"Keep 'em Flying . . ."

Many Aviation Plants are using Numerous

OLIVER DIE MAKING MACHINES

To speed up Defense Output on Dies—Gages—Cams—Templates—Experimental Work, etc.

* * * * * *

Savings are large—work is more accurate—you require less skilled operators.

* * * * * *

A real opportunity for saving at a small investment. Send for Bulletin Today.

PROMPT DELIVERIES

OLIVER INSTRUMENT CO. 1436 Maumee Street, East, Adrian, Michigan

SOLVE YOUR LEVELING PROBLEMS

with

EMPCO

Machine Jacks

Adjustment as precise as a "mike" reading. Inexpensive and long lasting.

Two sizes 8″ x 4″ x 3½″ and 6″ x 3″ x 2⅜″ — filled from stock — immediate delivery.

EMPCO

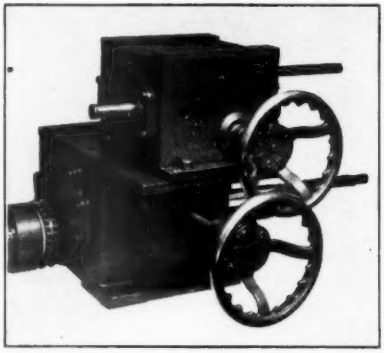
ENTERPRISE MACHINE PARTS CORPORATION

2735 JEROME AVENUE • DETROIT, MICHIGAN

FlexoiD Speed Control Units

THE Smith Power Transmission Co., Cleveland, O., manufacturers of FlexoiD Speed Control Units, state that the number of such units being incorporated into the designs of machine tools is steadily increasing. A very interesting recent application has been that of two FlexoiDs in the Yoder No. 3 horizontal boring mill, made by the Yoder Co. of Cleveland.

Two standard 8 speed FlexoiD Units were built into the Yoder mill. The upper unit is model 1-8, the lower model 2-8, each equipped with special ratios. The units operate independently and are as easily interchanged or replaced as motors. Control handles for shifting to desired speed ratios are grouped with other controls for the convenience of the operator.



The FlexoiD Units, made in three sizes, are built in both four and eight speed models. All speeds are controlled through a single hand wheel. All shafts and gears are made of alloy hardened steel; shafts are one piece, solidly mounted at each end in SKF Ball Bearings. No pilot bearings or bronze bushings are used. Gears operately quietly on spline shafts.

The FlexoiD Units are particularly adaptable for modernizing machine tools —they reduce power costs, eliminate line shaft maintenance, increase safety and permit regrouping of machines for greater efficiency. The input and output shafts may be direct-connected or driven by flat or V-belt or chain. The units allow space with low head room to be utilized, a valuable advantage in many crowded shops or in buildings not designed for machine tool operation.

For complete details on the FlexoiD Speed Control Units write Smith Power Transmission Co., Dept. TD, 1545 E. 23d St., Cleveland, O.

ARE WE MANUFACTURING
TURNINGS?
LOOK AT THESE FIGURES ON THAT LAST SHAFT WE BORED!
COST SHEET
1" of 6" tool steel bar bored into a tube with a 1" wall
Equals
1" of 4" bar turned into a Pile of Scrap

Use BISCO Tool Steel Tubing and stop the waste of costly steel. At 40c a pound, this firm had $17.20 worth of turnings to sweep up. BISCO Tubes are stocked in standard sizes up to 12" O.D. When cut to your specifications they are ready for use as ring dies, bushings, spacers, etc.

Free Catalog On Request

Timken Co. Promotes Bessmer

DWIGHT A. BESSMER has been appointed to the position of Assistant Director of Purchases by The Timken Roller Bearing Company, Canton, O. Mr. Bessmer, with The Timken Company since 1929, has served in the capacity of Automotive Sales Engineer in the Detroit territory and as a buyer in the Purchasing Department.

BUY WITH CONFIDENCE

This directory of products lists for ready reference the names of manufacturers and dealers whose sales to The TOOL & DIE Journal readers have established them as dependable in every sense of the word. They merit your consideration.

Complete information about any product may be had upon request made to the firm listed or to us.

Your mention of The TOOL & DIE Journal will be appreciated.

ABRASIVE PAPER AND CLOTH
Carborundum Co., Niagara Falls, N. Y.
Norton Co., Worcester, Mass. (Behr-Manning Div.)

ASSEMBLING MACHINES—Automatic
Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland, O.

BAND SAWS—Metal Cutting
DoAll Co. Inc., 1203 Thacker St., Des Plaines, Ill.
Starrett Company, L. S. Athol, Mass.
The Tannewitz Works, Grand Haven, Mich.

BAR STOCK—Heat Treating
Lakeside Steel Improvement Co., 5418 Lakeside Ave., Cleveland, O.

BENCHES
Challenge Machinery Co., Grand Haven, Mich.

BENDERS
O'Neil-Irwin Mfg. Co., 315 8th Ave., So., Minneapolis, Minn.

BLOWERS
Johnson Gas Appliance Company, 611 E. Avenue, NW, Cedar Rapids, Ia.

BOLTS—Stripper
Allen Mfg. Co., Hartford, Conn.
Danly Machine Specialties, Inc., 2100 So. 52nd Ave., Chicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, O.
Holo-Krome Screw Corp., Hartford, Conn.

BORING HEADS—Offset
Precision Tool Co., The, P. O. Box 155, Brooklyn, N. Y.

BORING TOOLS
Bokum Tool Co., 49 W. Hancock Ave., Detroit, Mich.

BRAKES
O'Neil-Irwin Mfg. Co., 315 8th Ave., So., Minneapolis, Minn.

BROACHING MACHINES
American Broach & Machine Co., Ann Arbor, Mich.

BROACHING PRESSES—Standard and Utility
Colonial Broach Co., 147 Jos. Campau, Detroit, Mich.

BURNERS—Gas
Johnson Gas Appliance Company, 611 E. Avenue, N.W., Cedar Rapids, Ia.

BUSHINGS—Die
Acme Industrial Co., 206 No. Lafiin St., Chicago, Ill.
Danly Machine Specialties, Inc., 2100 So. 52nd Ave., Chicago, Ill.
Danneman Company, F. C., 203 Lafayette St., New York, N. Y.
Die Supply Co., 1390 E. 30th St., Cleveland, O.

BUSHINGS—Drill
Acme Industrial Co., 206 No. Lafiin St., Chicago, Ill.
Universal Engineering Co., Frankenmuth, Mich.

CALIPERS
Lufkin Rule Co., Saginaw, Mich.
Starrett Company, L. S., Athol, Mass.

CAMS
Gorton Machine Co., George, 1319 Racine St., Racine, Wis.

CAP SCREWS—Flat Head
Allen Mfg. Co., Hartford, Conn.

CAP SCREWS—Socket Head
Allen Mfg. Co., Hartford, Conn.
Willey's Carbide Tool Co., 1340 W. Vernor Highway, Detroit, Mich.

CARBIDE TOOLS AND BLANKS
Ex-Cell-O Corporation, 1202 Oakman Blvd., Detroit, Mich.

ALLEN Hexagon Hole Products and Diemakers' Accessories

Diemakers who specify "ALLENS" benefit from 32 years of *specialized experience* in the making of Hex-socketed Screws and Diemakers' Accessories, — "first aides" in accurate locating of work and rigid retention of assemblies.

The Hollow Screws of special alloy steel (ALLENOY) are heat-treated, instrument-tested for each physical property and individually hand-inspected. Allen-developed lead screw threading machines and the new "Duo-process" hold threads to exceedingly close tolerances. Sockets are true and clean, concentric with screw bodies.

The Dowel Pins (like the Hollow Screws) are of ALLENOY steel, precision ground, with tensile strength of 240,000 to 250,000 lbs. per square inch.

Full technical data in Folder G-21, — mailed on request.

Your local Allen Distributor will oblige with samples and the best service possible under present conditions.

THE ALLEN MANUFACTURING COMPANY
Hartford, Connecticut, U. S. A.

Gairing Tool Co., The, Roosevelt Park Annex, Detroit, Mich.
McKenna Metals Company, 500 Lloyd Ave., Latrobe, Pa.

CARBIDE TOOLS—Sintered
Firth-Sterling Steel Co., McKeesport, Pa.

CASTINGS—Air and Oil Hardening Tool Steel Cast to Shape
Forging and Casting Corp., The, Ferndale (Detroit), Mich.

CASTINGS—Nitri-Cast-Iron
Forging and Casting Corp., The Ferndale (Detroit), Mich.

CHUCKS—Collet
Gorton Machine Co., George, 1319 Racine St., Racine, Wis.
Hardinge Brothers, Inc., Elmira, N. Y.
Tomkins-Johnson Co., The, 630 North Mechanic St., Jackson, Mich.
Universal Engineering Co., Frankenmuth, Mich.

CLAMPS—Die
Danly Machine Specialties, Inc., 2100 So. 52nd Ave., Chicago, Ill.
Danneman Company, F. C., 203 Lafayette St., New York, N. Y.

CLAMPS—Toggle
Danly Machines Specialties, Inc., 2100 So. 52nd Ave., Chicago, Ill.
Detroit Stamping Co., 344 Midland Ave., Detroit, Mich.
Knu-Vise, Incorporated, 16877 Hamilton Ave., Detroit, Mich.

COLLET INDEX FIXTURES
Hardinge Brothers, Inc., Elmira, N. Y.

COMPOSITE DIE SECTION STEEL
Forging and Casting Corp., The, Ferndale, Mich.
Jessop Steel Co., 610 Green St., Washington, Pa.

CONTOUR METAL-WORKING MACHINES
Continental Machines, Inc., 1303 S. Washington Ave., Minneapolis, Minn.

COUNTERBORES
Allen Mfg. Co., Hartford, Conn.
Putnam Tool Co., 2985 Charlevoix Ave., Detroit, Mich.

CUTTERS—Die-Sinking
Gorton Machine Co., George, 1319 Racine St., Racine, Wis.
Tomkins-Johnson Co., The, 630 North Mechanic St., Jackson, Mich.

CUTTERS—Hard Carbide
McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.

CUTTERS—Milling
Gairing Tool Co., The, Roosevelt Park Annex, Detroit, Mich.
Putnam Tool Co., 2985 Charlevoix, Detroit, Mich.
Severance Tool Co., 1506 E. Genesee Ave., Saginaw, Mich.
Tomkins-Johnson Co., 630 N. Mechanic St., Jackson, Mich.

CYLINDERS—Hydraulic
Tomkins-Johnson Co., 630 N. Mechanic St., Jackson, Mich.

CYLINDERS—Pneumatic
Tomkins-Johnson Co., 630 N. Mechanic St., Jackson, Mich.

DEMAGNETIZERS
Alofs Mfg. Co., 1619 Madison Ave., S.E., Grand Rapids, Mich.

DIAMOND STONES
Carborundum Co., Niagara Falls, N. Y.
Norton Company, Worcester, Mass.

DIAMOND TOOLS
Diamond Tool Co., 938 E. 41st St., Chicago, Ill.

DIAMOND WHEELS
Carborundum Co., Niagara Falls, N. Y.
Norton Company, Worcester, Mass.

DIE CASTING MACHINES
Phoenix Machine Co., The, 2711 Church Ave., Cleveland, O.

DIE CENTERS—Hard Carbide
McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.

DIE CUSHIONS—Pneumatic
Dayton-Rogers Mfg. Co., Minneapolis, Minn.

DIE FILING MACHINES
Atlas Equipment Co., 101 S. Clinton St., Chicago, Ill.
Illinois Tool Works, 2503 N. Keeler Ave., Chicago, Ill.

DIE HANDLING TRUCKS
Hamilton Tool Co., Ninth and Hanover Sts., Hamilton, O.

DIE MAKERS SUPPLIES
Acme Industrial Co., 206 No. Lafin St., Chicago, Ill.
Danly Machine Specialties, Inc., 2100 So. 52nd Ave., Chicago, Ill.

DIE MAKING MACHINES
Continental Machines, Inc., 1303 S. Washington Ave., Minneapolis, Minn.
Oliver Instrument Co., 1436 Maumee St., E., Adrian, Mich.

UNBRAKO
Reg. U. S. Pat. Off.

KNURLED SOCKET HEAD CAP SCREWS

In strength and in accuracy, "Unbrako" cap screws exceed by a wide margin today's demands. They have to be good . . . they are good! But it's the famous *KNURLING* feature that puts "Unbrako" in a class by itself . . . that saves adjustment or assembly time wherever used. Ask your mechanic—he'll tell you.

Pat'd and Pat's Pend.

KNURLING of Socket Screws originated with "UNBRAKO" years ago.

STANDARD PRESSED STEEL CO.
JENKINTOWN, PENNA. box 600
— BRANCHES —
BOSTON • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

DIE SECTIONS—Composite Steel
Forging and Casting Corp., Ferndale (Detroit), Mich.
Jessop Steel Co., 610 Green St., Washington, Pa.

DIE SECTIONS—Forged
Ajax Steel and Forge Co., 205 Adair St., Detroit, Mich.
Forging and Casting Corp., The, Ferndale, Mich.

DIE SETS
Danly Machine Specialties, Inc., 2100 So. 52nd Ave., Chicago, Ill.
Danneman Co., F. C., 203 Lafayette St., New York, N. Y.
Die Supply Co., 1390 E. 30th St., Cleveland, O.
Producto Machine Co., The, 990 Housatonic Ave., Bridgeport, Conn.

DIE STEELS
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop Steel Co., 610 Green St., Washington, Pa.
Ryerson & Son, Inc., Joseph T., Chicago, Ill.

DIE STOCK
Masonite Corp., Dept. TD-1, 111 W. Washington St., Chicago, Ill.

DIE SUBSTITUTE MACHINES
O'Neil-Irwin Mfg. Co., 315 8th Ave., So., Minneapolis, Minn.

DIES—Carbide
Tungsten Electric Corp., 570 39th St., Union City, N. J.

DOGS—Lathe and Milling Machine
Armstrong Bros. Tool Co., 340 N. Francisco Ave., Chicago, Ill.

DOWEL PINS
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Allen Mfg. Co., Hartford, Conn.
Danly Machine Specialties, Inc., 2100 So. 52nd Ave., Chicago, Ill.
Danneman Co., F. C., 203 Lafayette St., New York, N. Y.
Die Supply Co., 1390 E. 30th St., Cleveland, O.

DRESSERS—Quick Angle
Welch Industries, Inc., 19901 W. Eight Mile Rd., Detroit, Mich.

DRESSING STICKS
Carborundum Co., Niagara Falls, N. Y.
Norton Company, Worcester, Mass.

DRILL HEADS—Adjustable
Linderme Machine and Tool Co., 12250 Coyle Ave., Detroit, Mich.

DRILL JIGS—Standard
Esco Engineering Corp., 4855 Fourth Ave., Detroit, Mich.

DRILL JIG—Toggle Action
Knu-Vise, Incorporated, 16877 Hamilton Ave., Detroit, Mich.

DRILL JIG BUSHINGS
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.

DRILL POINTERS
Oliver Instrument Co., 1436 E. Maumee St., Adrian, Mich.

DRILL PRESSES
Delta Mfg. Co., 611 A East Vienna Ave., Milwaukee, Wis.
Duro Metal Products Co., Dept. TP-13, 2649 N. Kildare Ave., Chicago, Ill.

DRILLING MACHINES — Automatic
Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland, O.
Taylor Mfg. Co., 3056 W. Meineke Ave., Milwaukee, Wis.

DRILLING, MILLING AND TAPPING UNITS
Enterprise Machine Parts Corp., 2731 Jerome Ave., Detroit, Mich.

DRILLS—Hardsteel
Black Drill Co., 5005 Euclid Ave. Cleveland, O.

DRIVE UNITS—Motorized
Cullman Wheel Co., 1332 Altgeld St., Chicago, Ill.
Drive-All Mfg. Co., 3400 Conner Ave., Detroit, Mich.

DUPLICATOR MACHINES
Gorton Machine Co., George, 1319 Racine St., Racine, Wis.

ELEVATING TABLES—Portable
Hamilton Tool Co., The, Ninth and Hanover Sts., Hamilton, O.

END MILLS
Gairing Tool Co., The, Roosevelt Park Annex, Detroit, Mich.
The Tomkins-Johnson Co., 630 N. Mechanic St., Jackson, Mich.
Putnam Tool Co., 2985 Charlevoix, Detroit, Mich.

EXTRACTOR—Broken Tap
The Walton Co., 88 Allyn St., Hartford, Conn.

FILES—Band
DoAll Co., Inc., 1203 Thacker St., Des Plaines, Ill.

FILES—RIFFLERS
American Swiss File and Tool Co., Elizabeth, N. J.

FILES—Rotary
American Swiss File and Tool Co., Elizabeth, N. J.
Hamilton Tool Co., The, Ninth and Hanover Sts., Hamilton, O.
Grobet File Co. of America, 3 Park Place, New York, N. Y.
Severance Tool Co., 1506 E. Genesee Ave., Saginaw, Mich.

FILES—Swiss Pattern
American Swiss File and Tool Co., Elizabeth, N. J.
Grobet File Co. of America, 3 Park Place, New York, N. Y.

FILING MACHINES
Oliver Instrument Co., 1436 E. Maumee St., Adrian, Mich.

ARE YOU BAFFLED BY A SEALING PROBLEM?

IF you are faced with a perplexing seal job, Acme Industrial Company offers the aid of trained engineers who specialize in solving the most involved sealing problems.

Your product may include rotating seals that must retain fluids and gases. These, of course, must be properly sealed, not only to prevent costly leakage, but to forbid entrance of foreign particles.

Acme does exactly that . . . and more. The Acme method of lapping the surfaces provides seals that are initially tight . . . that stay tight indefinitely. Their strict uniformity cuts original assembly expense and practically eliminates re-assembly and re-testing costs.

Move Your Lapping to The ACME Plant!

Conserve space. Release skilled help for other important duties. Transfer your lapping and sealing jobs to the Acme plant. Your blueprint or complete seal in our hands will bring back valuable suggestions . . . will convince you that Acme service can form a lasting allegiance between your engineering and production departments and ours. Write.

ACME ADVICE IS YOURS FOR THE ASKING

ACME

ACME INDUSTRIAL COMPANY

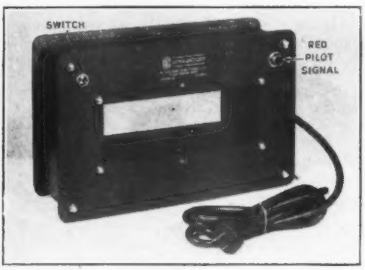
Makers of Standardized Jig and Fixture Bushings

206 N. Laflin St. Chicago, Ill. MONroe 4122

FILING MACHINES—Continuous
Continental Machines, Inc., 1303 Washington Ave., S., Minneapolis, Minn.
FILING MACHINES—Die and Punch
Marburg Bros., Inc., 92 West St., New York, N. Y.
FLAME HARDENING
Lakeside Steel Improvement Co., 5418 Lakeside Ave., Cleveland, O.
FORGINGS—General
Ajax Steel & Forge Co., 205 Adair St., Detroit, Mich.
FORGINGS — Water and Oil Hardening.
High Speed, Special Alloy, Stainless and S. A. E. Steel
Forging and Casting Corp., Ferndale (Detroit), Mich.
FURNACES—Case Hardening
Johnson Gas Appliance Co., 611 E. Ave., N. W., Cedar Rapids, Ia.
FURNACES—High Speed Steel
Johnson Gas Appliance Co., 611 E Avenue, NW, Cedar Rapids, Ia.
FURNACES — Tempering and Drawing
Despatch Oven Co., 600 S.E. Ninth St., Minneapolis, Minn.
Johnson Gas Appliance Co., 611 E Avenue, NW, Cedar Rapids, Ia.
GAGE BLOCKS
Ford Motor Co., Johansson Division, Dept. H., Dearborn, Mich.
George Scherr Co., 128-B Lafayette St., New York, N Y.
Webber Gage Co., 12903 Triskett Rd., Cleveland, O.
GAGES—Carbide Tipped
McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.
GAGES—Center, Depth, Planer, Telescoping, Surface, etc.
The Lufkin Rule Co., Saginaw, Mich.
L. S. Starrett Co., Athol, Mass.
GAGES—Dial
L. S. Starrett Co., Athol, Mass.
GAGES—Precision
Tools & Gages, Inc., 3112 E. 63rd St., Cleveland, O.
GAGES—Spring Stop
Knu-Vise, Incorporated, 16877 Hamilton Ave., Detroit, Mich.
GRINDERS—Abrasive Band and Disk
Walls Sales Corp., 97 Warren St., New York, N. Y.
GRINDERS—Carbide
Delta Mfg. Co., 611 A East Vienna Ave., Milwaukee, Wis.
Hammond Machinery Builders, Inc., 1631 Douglas Ave., Kalamazoo, Mich.
GRINDERS—Cutter
Gorton Machine Co., George, 1319 Racine St., Racine, Wis.
Norton Company, Worcester, Mass.
Oliver Instrument Co., 1436 Maumee St., E., Adrian, Mich.
GRINDERS—Cylindrical
Norton Company, Worcester, Mass.
GRINDERS—Hand
Chicago Wheel and Mfg. Co., 1101 W. Monroe St., Dept. TD., Chicago, Ill.
The Dumore Company, Dept. 372-A, Racine, Wis.
Duro Metal Products Co., 2649 N. Kildare Ave., Dept. TP-13, Chicago, Ill.
GRINDERS—Hydraulic Feed
Gallmeyer & Livingston Co., 304 Straight Ave., S.W., Grand Rapids, Mich.
GRINDERS—Internal
Majestic Tool and Mfg. Co., 2946 Woodbridge St., Detroit, Mich.
GRINDERS—Portable
Dumore Co., Dept. 372-A, Racine, Wis.
McGonegal Mfg. Co., 393 Railroad Ave., E. Rutherford, N. J.
GRINDERS—Precision for Contours
Baker Brothers, Inc., Toledo, O.
Boyar-Schultz Corp., 2112 Walnut St., Chicago, Ill.
Koestlin Tool & Die Corp., 3601 Humboldt Ave., Detroit, Mich.
GRINDERS—Surface
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Builders Iron Foundry, 23 Codding St., Providence, R. I.
Gallmeyer & Livingston Co., 304 Straight Ave., S.W., Grand Rapids, Mich.
Norton Company, Worcester, Mass.
GRINDERS—Swing Lathe
Jefferson Machine Tool Co., 710 N. W. 4th St., Cincinnati, O.
GRINDERS—Universal
Norton Company, Worcester, Mass.
Oliver Instrument Co., 1436 Maumee St., E., Adrian, Mich.
GRINDERS—Utility
M-B Products, 130 E. Larned St., Detroit, Mich.
GRINDER CENTERS
McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.
GRINDER TOOLS
Norton Company, Worcester, Mass.
GRINDING MACHINES—Cutter
Oliver Instrument Co., 1436 Maumee St., E., Adrian, Mich.
GRINDING MACHINES—Tap
Oliver Instrument Co., 1436 Maumee St., E., Adrian, Mich.

AMC DEMAGNETIZER

A Tool Room Necessity



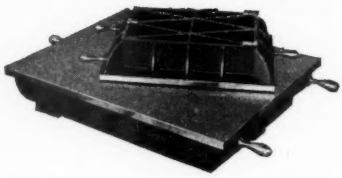
Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

Price is only $32.50, complete as shown.

Write for full information.

ALOFS MFG. CO.
1619 Madison Ave., S. E., Grand Rapids, Mich.

MILWAUKEE SURFACE PLATES



A full line of surface plates, angles and box parallels. Standard plate sizes from 8" x 12" to 48" x 96", larger sizes with or without legs. Plates are finish-planed and scraped to insure a very accurate surface.

Write for details

J. C. BUSCH CO.
Engineers and Machinists Since 1907
172 SO. FERRY ST., MILWAUKEE, WIS.

GRINDING & LAPPING—Precision
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.

GRINDING WHEELS
Carborundum Company, The, Niagara Falls, N. Y.
Norton Company, Worcester, Mass.

GUIDE PINS
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Danly Machine Specialties, Inc., 2100 So. 52nd Ave., Chicago, Ill.
Danneman Company, F. C., 203 Lafayette St., New York N. Y.
Die Supply Co., 1390 E. 30th St., Cleveland, O.

HAMMERS & MALLETS—Rawhide
Chicago Rawhide Mfg. Co., 1280 Elston Ave., Chicago, Ill.

HARDNESS TESTERS
Shore Instrument & Mfg. Co., Inc., The, 9025 Van Wyck Ave., Jamaica, N. Y.

HOLDERS—Tool
Armstrong Bros. Tool Co., 340 N. Francisco Ave., Chicago, Ill.

HONING MACHINES—Horizontal
Enterprise Machine Parts Corp., 2731 Jerome Ave., Detroit, Mich.

INDICATORS
The Lufkin Rule Co., Saginaw, Mich.

INDICATORS—Dial
L. S. Starrett Co., Athol, Mass.

INDICATORS—Test
The Koch Test Indicator, 28 Second Ave., Nyack, N. Y.
L. S. Starrett Co., Athol, Mass.

INDEXING DEVICES
Hardinge Brothers, Inc., Elmira, N. Y.
Hartford Special Machy. Co., 281 Homestead Ave., Hartford, Conn.
Jefferson Machine Tool Co., 710 N.W. Fourth St., Cincinnati, O.

JACKS—Machine
Enterprise Machine Parts Corp., 2731 Jerome Ave., Detroit, Mich.

KEYS—Socket Screw
Holo-Krome Screw Corp., Hartford, Conn.

LAPS—Copper Head Expansion
Boyar-Schultz, Inc., 2112 Walnut St., Chicago, Ill.

LAPPING—Contract
Acme Industrial Co., 206 N. Laflin St., Chicago, Ill.

LAPPING COMPOUND
Carborundum Company, The, Niagara Falls, N. Y.

LAPPING MACHINES
Norton Company, Worcester, Mass.
Schraner & Co., A. P., 3338 Payne Ave., Cleveland, O.
Ultra Lap Machine Co., 245 McDougall Ave., Detroit, Mich.

LATHE CENTERS
McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.

LATHES—Toolroom
Atlas Press Co., 212 N. Pitcher Ave., Kalamazoo, Mich.
Monarch Machine Tool Co., The, Sidney, O.
Sheldon Machine Co., Inc., 4236 No. Knox Ave., Chicago, Ill.
South Bend Lathe Works, 493 E. Madison St., South Bend, Ind.

LAYOUT DYE
Dayton-Rogers Mfg. Co., Minneapolis, Minn.
Michigan Chrome and Chemical Co., 6350 E. Jefferson Ave., Detroit, Mich.

LEADER PINS
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, O.

LUBRICANTS
Wayne Chemical Products Co., 9425 Copeland St., Detroit, Mich.

MACHINE VISES
Gorton Machine Co., George, 1319 Racine St., Racine, Wis.
Producto Machine Co., The, 990 Housatonic Ave., Bridgeport, Conn.

MARKING DEVICES
AcromarK Company, The, 261 North Broad St., Elizabeth, N. J.

METAL DUPLICATING MACHINES
O'Neil-Irwin Mfg. Co., 315 8th Ave., So., Minneapolis, Minn.

MICROMETERS
The Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.
Scherr Co., Inc., George, 128-B Lafayette St., New York, N. Y.

MILLING MACHINES — Attachments
Gorton Machine Co., George, 1319 Racine St., Racine, Wis.
Kearney & Trecker Corp., West Allis Station, Milwaukee, Wis.

MILLING MACHINES—Continuous
Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland, O.

MILLING MACHINES—Precision
Hardinge Brothers, Inc., Elmira, N. Y.
Jefferson Machine Tool Co., 710 N. W. Fourth St., Cincinnati, O.

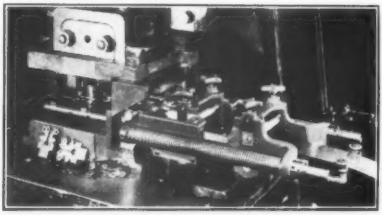
MILLING MACHINES—Vertical
Gorton Machine Co., George, 1319 Racine St., Racine, Wis.
Jackson Machine & Tool Co., 956 Roberts St., Jackson, Mich.
Kearney & Trecker Corp., West Allis Station, Milwaukee, Wis.
Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland, O.

NUMBERING DEVICES
AcromarK Company, The, 261 N. Broad St., Elizabeth, N. J.

OVENS—Industrial
Despatch Oven Co., 600 S.E. Ninth St., Minneapolis, Minn.
Johnson Gas Appliance Co., 611 E. Ave., N. W., Cedar Rapids, Ia.
Lydon Bros., 231 Colden St., Jersey City, N. J.

Dickerman
HITCH AND DIE FEEDS

The standard Dickerman cam operated Hitch Feed, a self-contained unit for attachment to the die set and operated from the ram or stroke of the press, is widely used because of its simplicity, ease of adjustment, accuracy of feed, short setup and low cost.



Built in 2″ and 4″ Feed, the Dickerman is readily adaptable on any type of power press.

The Dickerman Die Feed, twin cam operated, handles coiled stock of any practical thickness up to 4″ wide and feed length to 3″. Can be placed in any position on the die set for any style die. Eliminates jams, easily and quickly installed.

Complete information on Dickerman Hitch or Die Feeds including making and installing cams will be sent on request.

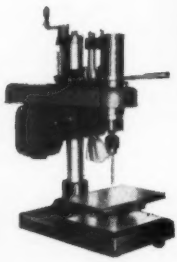
THE PRODUCTO MACHINE CO.
990 HOUSATONIC AVE., BRIDGEPORT, CONN.
3017 Medbury Ave. - - Detroit, Mich.

DIE SUPPLY COMPANY
1390 E. 30th St., Cleveland, Ohio

for the NEW YEAR

Save Wear and Tear on Your Small Drills and Taps . . . Use Hamilton Drilling and Tapping Machines

THE HAMILTON TOOL CO.
Ninth and Hanover Streets.
HAMILTON OHIO



The HAMILTON MUEHLMATT Super Sensitive DRILLING MACHINE

FOR small holes .004" to .250" diameter.

MEET 1942 prepared to cope with conditions . . . with better production . . . more economically.

PLATES—Bench, Lapping, Surface
Busch Company, J. C., 172 S. Ferry St., Milwaukee, Wis.
Challenge Machinery Co., Grand Haven, Mich.
Delta Mfg. Co., 611 A East Vienna Ave., Milwaukee, Wis.

PLUGS—Hollow Pipe
Holo-Krome Screw Corp., Hartford, Conn.

POLISHING & BUFFING MACHINES—Automatic Continuous
Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland, O.

POLISHING GRAIN
Carborundum Company, Niagara Falls, N. Y.
Norton Company, Worcester, Mass.

PRESSES—Arbor
Atlas Press Co., 212 N. Pitcher Ave., Kalamazoo, Mich.

PRESSES—Drill
Delta Mfg. Co., 611 A East Vienna Ave., Milwaukee, Wis.
Duro Metal Products Co., Dept. TP-13, 2649 N. Kildare Ave., Chicago, Ill.

PRESSES—Hand Punch
Leslie Welding Co., 2941 Carroll Ave., Chicago, Ill.

PRESSES—Utility
Producto Machine Co., The, 990 Housatonic Ave., Bridegport, Conn.

PRODUCTION MACHINE REPAIR PARTS
Enterprise Machine Parts Corp., 2731 Jerome Ave., Detroit, Mich.

PULL FEEDS—Adjustable
Jefferson Machine Tool Co., 710 N. W. 4th St., Cincinnati, O.

PUMPS—Hydraulic
Racine Tool and Machine Co., 1768 State St., Racine, Wis.

PUNCHES—Hand, Toggle Action
Knu-Vise, Incorporated, 16877 Hamilton Ave., Detroit, Mich.

PUNCHES — Standard & Interchangeable
Hovis Screwlock Co., 8100 E. Nine Mile Road, Van Dyke, Mich.

RACKS—Bar Stocks
Wm. S. Yohe Supply Co., 507 Gibbs Ave., N. E., Canton, O.

REAMERS
Gairing Tool Co., The, Roosevelt Park Annex, Detroit, Mich.
Putnam Tool Co., 2985 Charlevoix Ave., Detroit, Mich.

REAMERS—Self-centering Cylinder
Royal Oak Tool & Machine Co., 621 E. Fourth Street, Detroit, Mich.

RETAINERS—Punch & Die
Hovis Screwlock Co., 8100 E. Nine Mile Road, Van Dyke, Mich.

RIVETING MACHINES—Hydraulic
Tomkins-Johnson Company, The, 630 N. Mechanic St., Jackson, Mich.

ROLL FEEDS—Automatic
Wittek Mfg. Co., 4305-15 W. 24th Place, Chicago, Ill.

SANDERS—Belt
Duro Metal Products Co., Dept. TP-13, 2649 N. Kildare Ave., Chicago, Ill.
Jefferson Machine Tool Co., 710 N. W. 4th St., Cincinnati, O.

SANDING RIDDLES — Gyrating Foundry
Jefferson Machine Tool Co., 710 N. W. 4th St., Cincinnati, O.

SAWING MACHINERY
Tannewitz Works, The, Grand Rapids, Mich.

SAWING MACHINES—Continuous
Continental Machines, Inc., 1303 So. Washington St., Minneapolis, Minn.

SAWING MACHINES—Metal
Armstrong-Blum Mfg. Co., 5700 Bloomingdale Ave., Chicago, Ill.
Peerless Machine Co., Dept TDJ-142, Racine, Wis.
Racine Tool & Machine Co., 1768 State St., Racine, Wis.

SAWS—Band
DoAll Co., Inc., 1203 Thacker St., Des Plaines, Ill.
Duro Metal Products Co., Dept. TP-13, 2649 N. Kildare Ave., Chicago, Ill.
Armstrong-Blum Mfg. Co., 5700 Bloomingdale Ave., Chicago, Ill.

SAWS—Hydraulic
Racine Tool & Machine Co., 1768 State St., Racine, Wis.

SCREW MACHINE PRODUCTS—Contract
Star Machine & Tool Co., 9320 Woodland Ave., Cleveland, O.

SCREW MACHINE PRODUCTS—Hardened & Ground
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.

SCREW MACHINES — Precision Bench Type
Hardinge Brothers, Inc., Elmira, N. Y.

SCREWS—Socket Head
Danly Machine Specialties, Inc., 2100 So. 52nd Ave., Chicago, Ill.
Danneman Company, F. C., 203 Lafayette St., New York, N. Y.
Die Supply Co., 1390 E. 30th St., Cleveland, O.
Holo-Krome Screw Corp., Hartford, Conn.

Micro Supreme LAY-OUT DYE

PUT IT TO
YOUR OWN TESTS
FOR TOOL, DIE, PATTERN OR TEMPLATE LAYOUT ON METAL. A handy five-ounce can sent to you postpaid for . . . . . 60¢
MICHIGAN CHROME & CHEMICAL CO.
6350 E. Jefferson Ave. • Detroit

SHARPLY DEFINED SCRIBED LINES

Standard Pressed Steel Co., Box 600, Jenkintown, Pa.
Strong, Carlisle & Hammond Co., 1392 West Third St., Cleveland, O.

SCRIBERS
Starrett Co., L. S., Athol, Mass.

SET SCREWS—Hollow
Allen Mfg. Co., Hartford, Conn.

SET SCREWS—Square Head
Allen Mfg. Co., Hartford, Conn.

SHAPERS
Atlas Press Co., 212 N. Pitcher Ave., Kalamazoo, Mich.

SHARPENING STONES
Carborundum Company, Niagara Falls, N. Y.
Norton Company (Behr-Manning Div.), Worcester, Mass.

SHEARS—Bench
O'Neil-Irwin Mfg. Co., 315 8th Ave., So., Minneapolis, Minn.

SINE BARS
Ford Motor Co., Johansson Div., Dept. H., Dearborn, Mich.

SLOTTERS
Douglas Machinery Co., 150 Broadway, Dept. 80-6, New York, N. Y.

SPACERS—For Milling Machine Arbors
Detroit Stamping Co., 344 Midland Ave., Detroit, Mich.

SPECIAL MACHINE—Designing
Enterprise Machine Parts Corp., 2731 Jerome Ave., Detroit, Mich.
Sommer & Adams Co., 18511 Euclid Ave., Cleveland, O.

SPOT FACERS
Bokum Tool Co., 49 W. Hancock Ave., Detroit, Mich.

SPRINGS—Die
Danly Machine Specialties, Inc., 2100 So. 52nd Ave., Chicago, Ill.
Danneman Company, F. C., 203 Lafayette St., New York, N. Y.
Die Supply Co., 1390 E. 30th St., Cleveland, O.
Precision Spring Corp., 15400 Woodrow Wilson Ave., Detroit, Mich.

SPROCKETS—Roller and Block
Cullman Wheel Co., 1332 Altgeld St., Chicago, Ill.

SQUARES—Combination, Try and Mitre
The Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

STAMPINGS
Barth Stamping & Machine Works, W. 34th & Denison, Cleveland, O.
Davis Tool & Engineering Co., 19250 Plymouth Rd., Detroit, Mich.
Denning Mfg. Co., The, 1775-81 E. 87th St., Cleveland, O.
Detroit Stamping Co., 344 Midland Ave., Detroit, Mich.
Federal Tool Corp., 400 N. Leavitt St., Chicago, Ill.
Star Machine & Tool Co., 9320 Woodland Ave., Cleveland, O.
Variety Machine & Stamping Co., The, 12695 Elmwood Ave., Cleveland, O.

STAMPS—Steel
AcromarK Company, The, 261 N. Broad St., Elizabeth, N. J.

STEEL—Alloy
Columbia Tool Steel Co., 410 East 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1260-1264 West Fourth St., Cleveland, O.
Forging and Casting Corp., Ferndale (Detroit), Mich.
Jessop Steel Co., 610 Green St., Washington, Pa.
Ryerson & Son, Inc., Joseph T., Chicago, Ill.
Timken Roller Bearing Co., The, Steel and Tube Div., Canton, O.
Wheelock-Lovejoy & Co., Inc., 130 Sidney St., Cambridge, Mass.

STEEL—Carbon
Columbia Tool Steel Co., 410 East 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1260-1264 West Fourth St., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop Steel Co., 610 Green St., Washington, Pa.
Ryerson & Son, Inc., Joseph T., Chicago, Ill.

STEEL—Chromium
Darwin & Milner, Inc., 1260-1264 West Fourth St., Cleveland, O.
Ryerson & Son, Inc., Joseph T., Chicago, Ill.

STEEL—"Cobalt"
Darwin & Milner, Inc., 1260-1264 West Fourth St., Cleveland, O.

STEEL—Composite Die Section
Forging and Casting Corp., The, Ferndale, Mich.

STEEL—Graphitic
Timken Roller Bearing Co., The, Steel and Tube Div., Canton, O.

STEEL—High Speed
Ajax Steel & Forge Co., 205 Adair St., Detroit, Mich.
Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh, Pa.
Columbia Tool Steel Co., 410 East 14th St., Chicago Heights, Ill.

Another "Hit" for Defense Production

the Jackson No. 1 Horizontal MILLING MACHINE

The new Jackson No. 1 Horizontal Milling Machine is designed for tool room, experimental and production work that can be most efficiently and economically done by a small precision unit.

The new mill—quality built of high grade materials—will handle 3/8" cut, 3/4" deep in solid steel at one cut. Cutter capacity 1/2".

Production in our new enlarged plant permits best possible deliveries.

Full specifications sent promptly.

Wire, Phone or Write

Jackson Machine & Tool Company Sales Division
956 Roberts St. Jackson, Michigan

Darwin & Milner, Inc., 1260-1264 West Fourth St., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Forging and Casting Corp., Ferndale (Detroit), Mich.
Jessop Steel Co., 610 Green St., Washington, Pa.
Ryerson & Son, Inc., Joseph T., Chicago, Ill.

STEEL—Hobbing
Jessop Steel Co., 610 Green St., Washington, Pa.

STEEL—Tool & Die
Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh, Pa.
Columbia Tool Steel Co., 410 E. 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1260-1264 West Fourth St., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Forging and Casting Corp., Ferndale (Detroit), Mich.
Jessop Steel Co., 610 Green St., Washington, Pa.
Ryerson & Son, Inc., Joseph T., Chicago, Ill.
Wheelock-Lovejoy & Co., Inc., 130 Sidney St., Cambridge, Mass.

STEEL PLATE—Ground
Die Supply Co., 1390 E. 30th St., Cleveland, O.

STEEL PLATE—Rough or Machined Torch Cut Shapes
Danly Machine Specialties, Inc., 2100 So. 52nd Ave., Cnicago, Ill.
Die Supply Co., 1390 E. 30th St., Cleveland, O.
Ryerson & Son, Inc., Joseph T., Chicago, Ill.

STEEL TREATING—Hardening
Lakeside Steel Improvement Co., 5418 Lakeside Ave., Cleveland, O.

SURFACE PLATES
Busch Company, J. C., 172 S. Ferry St., Milwaukee, Wis.
Challenge Machinery Co., Grand Haven, Mich.
Delta Mfg. Co., 611 A East Vienna Ave., Milwaukee, Wis.

TAP EXTENSIONS
Allen Mfg. Co., Hartford, Conn.

TAP EXTRACTOR
The Walton Co., 88 Allyn St., Hartford, Conn.

TAPPER—Precision
The Viking Tool & Machine Corp., 6 Main St., Belleville, N. J.

TOOL CHESTS
Gerstner Tool Chests, 56 Columbia St., Dayton, O.

TOOL STEEL—see STEEL—Tool and Die

TOOLS AND DIES—Carboloy
Kiffer Tool & Die Co., 5601 Tillman Ave., Cleveland, O.

TOOLS—Carbide Tipped
Ex-Cell-O Corporation, 1206 Oakman Blvd., Detroit, Mich.
McKenna Metals Co., 500 Lloyd Ave., Latrobe, Pa.

TOOLS—Diamond
Diamond Tool Co., 938 E. 41st St., Chicago, Ill.

TOOLS—Precision, Diemakers
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

TOOLS—Sintered Carbide
Firth-Sterling Steel Co., McKeesport, Pa.

TORCHES—Hand Gas
Johnson Gas Appliance Company, 611 E. Avenue, N. W., Cedar Rapids, Ia.

TUBING—Tool Steel
Bissett Steel Co., The, 943 E. 67th St., Cleveland, O.

TURRETS FOR TAIL-STOCK SPINDLE
Jefferson Machine Tool Co., 710 W. 4th St., Cincinnati, O.

TURRETS FOR TOOL-POST CARRIAGE
Jefferson Machine Tool Co., 710 N. W. 4th St., Cincinnati, O.

TYPE HOLDER
AcromarK Company, The, 261 No. Broad St., Elizabeth, N. J.

VISES—Machine
Jefferson Machine Tool Co., 710 N.W. Fourth St., Cincinnati, O.
Producto Machine Co., The, 990 Housatonic Ave., Bridgeport, Conn.

WELDING
Danly Machine Specialties, Inc., 2100 So. 52nd Ave., Chicago, Ill.

WELDING PLIERS
Knu-Vise, Incorporated, 16877 Hamilton Ave., Detroit, Mich.

WELDING POSITIONERS
Cullen-Friestedt Co., 1316 S. Kilbourn Ave., Chicago, Ill.

WELDING RODS
Darwin & Milner, Inc., 1260-1264 West Fourth St., Cleveland, O.

WHEELS—Mounted
Chicago Wheel and Mfg. Co., 1101 W. Monroe St., Dept. TD, Chicago, Ill.

WRENCH SETS
Allen Mfg. Co., Hartford, Conn.

TANNEWITZ DI-SAW
SAVES AN AVERAGE OF $4.80 EACH HOUR IT'S USED

Inside and outside cuts on dies, shoes, templets and endless other jobs can be done in a small fraction of the time required by former methods. Saws, files, and polishes. A highly developed, large capacity machine which will enable you to do in minutes jobs which otherwise require hours. Get the complete facts.

Simply ask for DI-SAW Bulletin.

Built by Sawing Machinery Specialists

THE TANNEWITZ WORKS
GRAND RAPIDS - MICHIGAN

Columbia
TOOL STEEL

TO DETROIT USERS—

In the Detroit district S. E. Sjogren, District Sales Manager, and staff offer users a wide operating and field experience.

Office and warehouse, 1718 Howard Street; phone Randolph 2584.

It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY
ARTHUR T CLARAGE PRESIDENT
410 EAST 14TH STREET • CHICAGO HEIGHTS ILL

Kearney & Trecker Accepts Major Machine Contract

KEARNEY & Trecker Corporation, Milwaukee, Wis., has accepted a defense order contract calling for 1,696 milling machines of a total value of $9,650,826, according to Ralph W. Burk, general sales manager. This is the second major contract received from the Defense Plant Corporation in Washington, and brings the total number of machines on order for the Defense Plant Corporation to 2,306 with a total value of $13,820,774. This raises the company's backlog of unfilled orders to 5,468 machines with a total value of more than $35,000,000.

Mr. Burk states that the company's plant, the largest in the world devoted exclusively to the manufacture of milling machines, is operating on a twenty-four-hour-a-day basis, seven days a week, and employs approximately 3,600 persons. Wage dividends to these employes now are running at the rate of $900,000 a year.

Vinco Dresser Incorporates Tangent Angle Principle

THE Vinco Dresser, manufactured by the Vinco Tool Co., Detroit, Mich., incorporates the basic patented principle of dressing radii, angles and angles tangent to radii on abrasive wheels from the same axis without moving the diamond.

In radii dressing, the entire instrument, with the exception of the base, rotates on pre-loaded precision ball bearings in a ball race which is ground into the hardened base. When positioning of the diamond is not changed after dressing a radius, angles may be dressed which are absolutely tangent to this radius.

All parts of the Vinco Dresser subject to wear are hardened, rough ground, finish ground and lapped. The Vinco Dresser is made to precision limits. The index plate and vernier are graduated on a Vinco Master Dividing Head to a one tenth thousandth of an inch accuracy.

Further information and descriptive literature showing typical examples will be sent by Vinco Tool Co., 7353 Central Ave., Detroit, Mich.

Keep 'em PST Turning

FlexoiD

INDUSTRIAL Couplings

—definitely do "Keep 'em Turning" by creating a flexible joint in shafting that aids in eliminating wear and tear on the driving units. Dealers in principal cities carry stocks for immediate delivery.

FLEXOID COUPLING CO., Div.
THE SMITH POWER TRANSMISSION CO.
1545 E. 23rd Street Cleveland, Ohio

Write for Folder TD

M-B "UTILITY" Pneumatic GRINDER

MODEL U-TR
A 60,000 R.P.M. Unit

STEEL HOUSING—FOR SAFETY

DESIGNED for real production work and the toughest jobs. A powerful, high-speed tool, widely used and recommended. . . . A worthy companion to our famous "SUPER SPEED" MODEL S.S.-S.R. Precision made, streamlined, excellent balance. Special grease-sealed bearings — no lubrication required.

A FAST-CUTTING STURDY TOOL

Also Other Models, and Air Line Filters and Automatic Air Line Lubricators.

Write for Circular and Details of FREE TRIAL OFFER

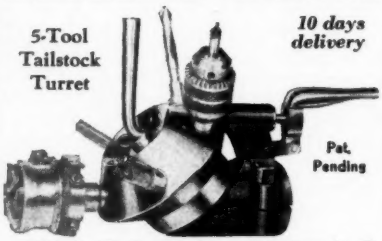
M-B PRODUCTS
130 E. LARNED ST., DETROIT, MICH.

EXPORT OFFICE
44 WHITEHALL ST.
New York, N.Y., U.S.A.

SAVE TIME ON DEFENSE WORK

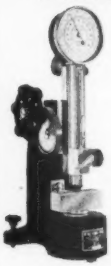
Convert your present lathe into a Turret Lathe in 15 seconds by attaching this Turret to the Tailstock Spindle of your engine lathe. Five tools automatically center when brought into play. Made in 4 sizes to fit lathes with 20" swing down to the small bench lathes. When ordering new lathes, be sure to specify Jefferson Turrets.

We also manufacture Belt Sanders, Swing Frame Grinders, Gyratory Foundry Riddles and Milling Machines. Let us mail Bulletins giving full details.



JEFFERSON MACHINE TOOL CO. **710 N. W. Fourth St. Cincinnati, O.**

HARDNESS TESTING



has been done
with the
SCLEROSCOPE
since 1907

•

THE SHORE INSTRUMENT & MFG. CO., INC.
9025 Van Wyck Avenue
Jamaica, N. Y.

Sommer & Adams Steps Up Production on Milling Machine

TO meet the steadily increasing demand, the Sommer & Adams Co., Cleveland, O., has stepped up the production of their Cleveland No. 1. Vertical Milling Machine. A small, rigid, high-speed miller, embodying all the essential features required by the modern tool room, die and mold shop as well as production plants, the No. 1 Cleveland in the year that it has been on the market

(Continued on next Page)

How to save money and increase production—

HERE is a comprehensive manual of safety promotion, fully explaining the principles and methods by which industrial concerns may avoid monetary losses and delayed production arising from accidents. Filled with factual cases and data, the book shows exactly how to analyze the accident situation in a particular plant, find the causes, develop the remedies, and carry them out. Gives special emphasis to the human factor in safety work and how to deal with it to make preventive measures effectual.

—with modern safety methods in manufacturing and construction work

—Just Out!—

INDUSTRIAL ACCIDENT PREVENTION

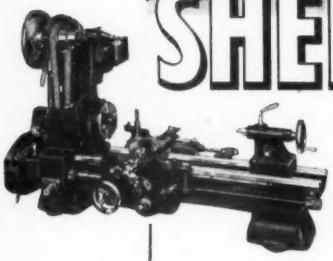
By H. W. Heinrich, The Travelers Insurance Co., 448 pages, 5½x8, 154 illustrations $3.00

Look up these specific aids:

—the simple formula for visualizing the meaning of accidents to industry and the fundamentals of reducing them. (Chapter 2)
—the appeals to use in gaining the effective support of personnel for the safety program. (Chapter 3)
—the case examples of hidden costs of accidents. (Page 51)
—the sample accident record forms. (Pages 117-120)
—the 6 steps in reducing the frequency and cost of handling-of-material accidents. (Page 166)
—the illustrations of 120 machine-guarding devices and methods. (Chapter 6)
—the 8 rules for reducing fatigue. (Page 287)
—the actual cases of safety education methods. (Page 348)

The TOOL & DIE Journal

2460 Fairmount Blvd. **Cleveland, O.**



SHELDON

Back Geared Screw Cutting PRECISION LATHES

A complete line of full sized, full weight 10", 11" and 12" Precision Lathes . . . bench, floor and pedestal types built to industrial machine tool standards and specifications. Rigid, heavily braced, semi-steel beds with hand scraped ways—2 "V"—Ways and 2 Flat Ways. Large hardened steel spindles, ground all over and individually fitted into hand scraped bearings. Each lathe has a full compliment of attachments and accessories. Each model gives more lathe per dollar.

See the SHELDON before you buy.

SHELDON MACHINE CO. INC.

4236 No. Knox Ave. Chicago, U. S. A.

(Continued from previous Page)

has proven its value as demonstrated by the volume of repeat and duplicate orders received.

The Cleveland No. 1 Vertical Spindle Milling Machine offers a number of design features including a heat treated and accurately ground spindle of chrome nickel steel; twelve speeds from 100 to 1850 rpm; table with 12 automatic longitudinal feeds ranging from .6" to 12½" per minute and with both cross feed and table screws mounted on double row Timken bearings.

Designed and built by a company whose principal business for 20 years has been the designing and building of special machines for the high production industries, the Cleveland Mill is precision built and rugged to give long, trouble-free performance.

A new circular giving complete specifications and design features of the Cleveland No. 1 Vertical Milling Machine will be sent on request. Address Sommer & Adams Co., 18511 Euclid Ave., Cleveland, O.

Speed Your PRODUCTION

30 DAY TRIAL OFFER

BACK OUT BROKEN TAPS *with* WALTON TAP EXTRACTORS

Broken pieces are backed out easily and quickly without annealing or drilling or damage to threads.

Stock sizes from No. 4 machine screws to 1½" in 2, 3 or 4-flute types.

World-wide acceptance for 30 years proves the value of Walton Tap Extractors.

Write for Circular 132. Select your sizes and put them to work at our risk.

THE WALTON CO.

88 Allyn Street Hartford, Conn.

● PROMPT DELIVERIES

Increased production facilities mean normal deliveries NOW and in the months ahead, on all Willey's Standard Tools as well as blanks of Willey's metal for those who manufacture their own tools.

Write for the 40 page WILLEY'S CATALOG

Forty pages of valuable information, covering all grades and classifications of Willey's standard tungsten carbide blanks, cutting tools and dies that increase production and lower costs.

WILLEY'S CARBIDE TOOL CO.

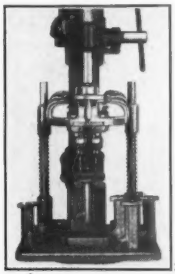
MANUFACTURERS AND SPECIALISTS IN TUNGSTEN CARBIDE TOOLS

1140 W. VERNOR HIGHWAY • DETROIT, MICHIGAN

LINCO *Two Spindle* Adjustable Drill Head

Also Adaptable for Tapping

Drills two holes at once, made in several sizes, drill centers ½" to 6", speeds up to 3600 RPM, capacity drills 0" to ⅝". Total weight of small head, with aluminum gear case, only 9½ lbs. Equipped with roller and ball thrust bearings. Especially engineered for Canedy Otto, Demco No. 15 and similar drill presses—also suitable for use on larger drill presses.



Descriptive Bulletin
Sent on request

LINDERME
Machine & Tool Company
12250 Coyle Ave.
DETROIT, MICHIGAN

ARMSTRONG SETTING-UP TOOLS

This is no time for machines to stand idle, while good tool makers rummage through the scrap heap for setting-up materials or waste valuable time fashioning make shift setting-up devices. Equip all planers, shapers, milling machines, drill presses and special machines with ARMSTRONG SETTING-UP TOOLS—Planer Jacks, Bracing Jacks, "T"-Slot Bolts and Drop Forged Strap Clamps that reduce setting-up time to a minimum, hold work and jigs rigidly, prevent delays, accidents and spoilage and stand up for years.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
340 N. Francisco Ave., Chicago
Eastern Warehouse & Sales: 199 Lafayette St., New York

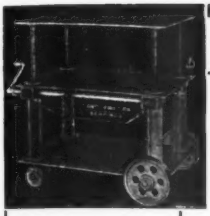
Write for Circulars

SHOP AIDS

INDUSTRIAL ACCIDENT PREVENTION—This is a practical and comprehensive manual based on extensive research in the causes of accidents and methods employed to prevent them. Considerable data on monetary costs and production interruptions are given. Analyses of accidents are given with effective, proven methods to avoid them. The safety psychology or human factor is treated in detail. The chapter on Machine and Power-Transmission Guarding is particularly well illustrated. The superintendent, safety director or foreman will find this book of great value. Written by H. W. Heinrich, assistant superintendent of Engineering and Inspection Division, The Travelers Insurance Co., this 448-page book sells for $3.00. Copies may be obtained from The TOOL & DIE Journal, 2460 Fairmount Blvd., Cleveland, O.

TOOL DESIGN—is a companion volume to "Tool Making" by C. B. Cole, president of Tool Equipment Sales Co. Designed especially "to fill the needs of ambitious beginners in the field of Tool Design and be of practical value in helping experienced men solve their design problems", the book

(Continued on next Page)



STYLE A

THE HAMILTON PORTABLE ELEVATING TABLE

FOR A MORE EFFICIENT NEW YEAR

"PORTELVATOR"

Not a shop accessory . . . but a shop necessity . . . for lifting . . . for bringing tools right to the job . . . as a bench . . . as a support.

1 to 20 ton, hand or power operated.

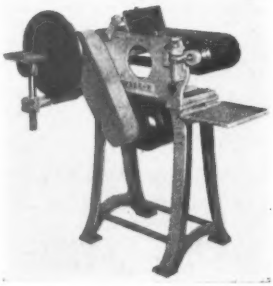
THE HAMILTON TOOL CO.
Ninth and Hanover Streets,
HAMILTON OHIO

SHOP AIDS (continued)

sticks to fundamentals and basic practical problems. Well illustrated by both drawings and photographs, with quiz questions at the end of each chapter, an appendix with carefully selected commonly used technical data, and an index, this book is an excellent shop aid for apprentices or text for students. "Tool Design", 479 pages plus appendix and index, sells at $3.50. Copies may be ordered from The TOOL & DIE Journal.

MECHANISM by S. E. Winston, associate professor of mechanical engineering, Illinois Institute of Technology, is a survey of commonly used principles of elementary mechanisms. The graphical method, rather than the algebraic method is stressed; the material assumes a knowledge of elementary trigonometry and mechanical drawing. Problems are illustrated, described in detail and many examples with their solutions are given. Data is arranged so that the student, apprentice or shopman can work out problems without help from any other source. "Mechanism" is a companion text to the same author's "Machine Design". Bound in washable cloth binding, "Mechanism" runs 372 pages with 199 illustrations and 250 problems. Copies may be ordered from The TOOL & DIE Journal at $3.50 postpaid.

Abrasive Band and Disc Grinder



The Duplex B-M Grinder, shown, is mounted on a substantial casting frame, with disc grinding table adjustable to any angle, fully enclosed Dual V belt drive and simple, practical new adjustment for taking up slack in V belt.

Full information sent promptly

WALLS SALES CORP.
97 Warren St. New York, N. Y.

FLAME HARDENING INCREASES LIFE OF WEARING PARTS

Flame hardening permits a hard case to be imparted to the wearing surface you desire, locally hardening the objects to the desired depth of hardness, maintaining the proper core structure and no sharp line of demarcation.

Parts of any size or shape can be hardened. There is no appreciable distortion. Chemical composition of the metal is unchanged. The hardened area does not spall off and cheaper base metals can be substituted.

CONSULT OUR ENGINEERS REGARDING YOUR HEAT TREATING PROBLEM.

Every type of heat treating is available—
Cyaniding—Carburizing—Chapmanizing—Nitriding
Flame Hardening—Heat Treating and Bar Straightening

The LAKESIDE STEEL IMPROVEMENT CO.
5418 Lakeside Ave. 24 Hour Service Call HEnderson 9100 Cleveland, O.

Tool · Die · Machine CONTRACT SHOPS

Modern facilities for every type of designing and building service.

Hartford, Connecticut

*HARTFORD SPECIAL MACHY. CO.
281 Homestead Avenue
SPECIAL MACHINES
Gears—Cams—Precision Specialties

Belleville, Illinois

DRESEL-BETZ COMPANY
Belleville, Ill.
Designers and Manufacturers of
TOOLS, DIES, JIGS
FIXTURES, METAL STAMPINGS

Chicago, Illinois

PRESS BRAKE DIES
AND PUNCHING
ATTACHMENTS for ALL
MAKES of PRESS BRAKES
DREIS & KRUMP MFG. CO.
7428 S. Loomis Blvd. Chicago, Ill.

*FEDERAL TOOL CORPORATION
400 North Leavitt St. HAYmarket 2150
Tools Dies Jigs Fixtures
Stampings Special Machinery

Detroit, Michigan

ACE TOOL & DIE COMPANY
3801 Trenton Ave. ORegon 1008
TOOLS and DIES
Special Machinery

DAVIS TOOL & ENGINEERING COMPANY
19250 Plymouth Rd. VErmont 5-6000
TOOLS and DIES
Special Machinery
Sheet Metal
Stampings and Assemblies

Detroit (Cont'd)

ENTERPRISE MACHINE PARTS CORP.
2731 Jerome Avenue TOwnsend 8-9643
PRODUCTION MACHINE REPAIR PARTS
Motor Drives, Gears, Worms, Tools, Fixtures
Machine Overhaul Specialists

*KOESTLIN TOOL & DIE CORPORATION
3601 Humboldt Ave. Detroit, Mich.
Manufacturers
Sheet Metal Dies "Grindrite" Die Grinders

*MAJESTIC TOOL & MFG. COMPANY
2946 Woodbridge St., East FItzroy 1011
Manufacturers
General line of Tool and Die Work, Tool Details, Parker High Speed Grinding Spindles

ROBBINS ENGINEERING COMPANY
637 Mt. Elliott Ave. FItzroy 4740
Designers and Manufacturers
Tools, Dies, Jigs, Fixtures
Special Machinery and Experimental Work

ROYAL OAK TOOL & MACHINE CO.
621 E. Fourth St., Royal Oak, Mich. ELmhurst 6580
Manufacturers of
Tools, Dies, Jigs, Fixtures. Special Machinery and Designing. Hoch Self-Centering Cylinder Reamers

Belleville, New Jersey

*THE VIKING TOOL & MACH. CORP.
6 Main St. Belleville, N. J.
TOOLS—DIES—JIGS—FIXTURES—MOLDS
GAGES—MACHINES—STAMPINGS
SPECIALTIES

Jamestown, New York

RANE TOOL CO., Inc.
17 Ross St. Phone 5934
Specialists In
BLANKING, FORMING and
DRAWING DIES

New York City, N. Y.

CONRAD & MOSER
8 East 12th St. New York City
Machine Tools & Molds, Parts & Machines
Aluminum Cast Parts—Aluminum Sheet
Formed Housings

*See larger display advertisement also.

Cleveland, Ohio

BARTH STAMPING & MACHINE WORKS
Die & Tool Makers
W. 34 & Denison — Fl. 8411

***THE BUNELL MACHINE & TOOL CO.**
1620 East 24th St. — PRospect 2681
DIES—JIGS—FIXTURES
Gages—Models
SPECIAL MACHINERY
Swiss Jig Boring
Screw Machine Products
Complete Engineering Facilities

CLEVELAND UNIVERSAL JIG COMPANY
13404 St. Clair Ave. — MUlberry 2600
Designers and Builders
Jigs & Fixtures Special Machines
Production Engineering
COMPLETE PLANT ROUTING and TOOLING

THE DENNING MANUFACTURING COMPANY
1775-81 East 87th St. — CEdar 0801
Designers and Builders
HIGH GRADE DIES

GENERAL DIE & TOOL COMPANY
2067 W. 55th St. — WOodbine 4736
Dies Tools Jigs Fixtures
Light Stampings Manufacturing Special Machinery

HAHN MANUFACTURING COMPANY
5332 Hamilton Ave. — ENdicott 2205
Modern equipped shop for building of
MEDIUM AND LARGE
DIES, TOOLS, SPECIAL MACHINERY
Equipment includes:
3" and 5" spindle Horizontal Boring Mills
Large planers — Vertical Mill

THE INDUSTRIAL MACHINE CO.
1436 East 47th Street — Founded in 1903
Builders of Special Machinery
GENERAL MACHINE WORK

*See larger display advertisement also.

KIFFER TOOL & DIE CO.
5601 Tillman Ave. — WOodbine 2440-2441
Manufacturers Special Machinery
Tools, Dies, Jigs, Fixtures, Tungsten Carbide Tools
SWISS JIG BORING

THE McKINNEY TOOL & MANUFACTURING CO.
1688 Arabella Rd. — KEnmore 1681
Designers and Builders
Jigs—Fixtures, Dies, Special Machinery
Swiss Jig Boring — General Machine Work

NOBLE & STANTON
998 Broadway — Bedford, Ohio
Bedford 585
Machine Work, Tools, Dies, Fixtures

***OHIO TOOL COMPANY**
3160 West 106th St. — ORchard 3200
Designers and Builders
SHEET METAL DIES, TOOLS, SPECIAL MACHINERY, DIE CASTING DIES
RUBBER MOULDS
•
Modern Facilities

THE PARAMOUNT TOOL CO.
1392-98 East 43rd St. — ENdicott 2220
JIGS, FIXTURES, DIES
Experimental Work

The PHOENIX MACHINE COMPANY
2711 Church Ave. — CHerry 1048
CONTRACT GRINDING
BORING and PLANING
Manufacturers of
LESTER-PHOENIX DIE CASTING AND PLASTIC MOLDING MACHINES

A. P. SCHRANER & COMPANY
3338 Payne Ave. — HEnderson 8644
EXTERNAL CYLINDRICAL LAPPING MACHINES
Special Machinery
TOOLS, DIES, JIGS, FIXTURES

***STAR MACHINE & TOOL COMPANY**
9320 Woodland Ave. — GArfield 2060
Designers and Builders
Dies, Jigs, Fixtures, Gages, Special Machinery
Jig Boring—Planer Equipment

(Continued on next Page)

Something NEW in Surface Plates

At remarkably low prices you can now get these new Delta Surface Plates offering features never before available in plates of this type. They are precision ground to close limits . . . all edges are machined square with each other and with the face . . . they have wide ledges all around for clamping work, angle plates, vises, etc. . . . and are of massive construction with heavy ribbing to prevent warping. Ideal for layout work . . . simple to convert into precision plates, if desired, by handscraping to each other or master plates. Far superior to makeshift plates. Order from

Two sizes: No. 640—15" x 18" at $16.00; No. 641—16" x 22" at $23.50. Immediate delivery.

THE DELTA MANUFACTURING COMPANY

611A-East Vienna Ave. Milwaukee, Wis.

(Continued from Page 95)

***THE SOMMER & ADAMS CO.**

18511 Euclid Ave. Kenmore 0810-0811

DESIGNERS AND BUILDERS OF

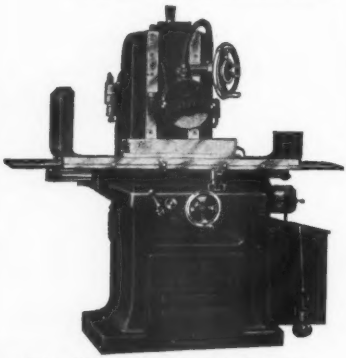
Special Machinery

TOOLS JIGS FIXTURES

The Cleveland No. 1 Vertical Milling Machine

Speed and

Precision *Combined*



IN GRAND RAPIDS HYDRAULIC FEED SURFACE GRINDERS DESCRIBED IN *BULLETIN* GL-100

Gallmeyer & Livingston Co.

304 Straight Ave. S. W. Grand Rapids, Mich.

***TOOLS & GAGES, Inc.**

3112 East 63rd St. MIchigan 7230

"Let us be your tool room."

DESIGNERS AND BUILDERS

Tools, Gages, Dies, Jigs, Fixtures

Special Machinery

SWISS JIG BORING

DIE CASTING DIES

THE VARIETY MACHINE & STAMPING COMPANY

12695 Elmwood Ave. LAkewood 8433

Designers and Manufacturers

Dies, Metal Stampings 250 tons capacity

Hamilton, Ohio

***THE HAMILTON TOOL COMPANY**

Ninth and Hanover Streets

Designers and Builders of

Tools, Dies, Jigs, Fixtures, Special Machinery

The Hamilton Portable Elevating Table

*See larger display advertisement also.

CLASSIFIED

MANUFACTURERS' AGENT, active throughout the State of Wisconsin and adjacent borderline counties of Illinois, desires affiliation with producers of metal cutting tools, screw machine tools and accessories. Can assure thorough, consistent coverage and substantial share of potential business. Box 1-4, The TOOL & DIE Journal, 2460 Fairmount Blvd., Cleveland, O.

"Die Designing and Estimating"

The new second edition of "Die Designing and Estimating" contains more than twice the material of the first separate editions and has been written especially for shops engaged in, and individual training for, defense work. Copies at $3.00 each may be secured from the TOOL & DIE Journal.

DI-ACRO BRAKE No. 2

Creates non-stock sized angles, channels, Vees, etc. Folding width 12". Right or left-hand operation. DI-ACRO BRAKE No. 1 smaller size, shearing width 6".

DI-ACRO
"DIE ACCURACY WITHOUT DIES"
PRECISION MACHINES

for METAL DUPLICATING without DIES!

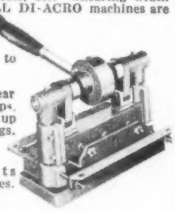
Send for Catalog

O'NEIL-IRWIN MFG. CO.
315 8th Ave., So.
Minneapolis, Minn.

DI-ACRO SHEAR No. 1

Trims duplicated stampings, shears stock sheets, etc. Shearing width 6". ALL DI-ACRO machines are accurate to .001".

This shear cuts strips, squares up stampings, cuts slits or notches.



Fosdick Issues Catalog on Medium Priced Jig Borer

THE Fosdick Jig Borer meets the demand for a medium priced machine that will produce diversified work with speed and accuracy. The simplicity of this machine enables an average drill press operator to perform accurate work on jigs, fixtures and miscellaneous production parts.

This jig borer has twelve speeds in geometrical progression with a range from 60 to 1500 rpm. There are nine feeds supplied, all of which are controlled by a simple lever with direct reading index. The range of feeds is from .00125" to .010" per revolution of spindle.

Tool shops that were heretofore not in position to purchase jig borers have done so since the moderately priced Fosdick Machine was designed. Extreme accuracy can be held if measuring rods and dial indicators are used. A complete working set of precision accessories is furnished as standard equipment.

A 20-page illustrated catalog, showing design features in detail and accessories, is available from Fosdick Machine Co., Box TD, Cincinnati, O.

DIAMONDS *for Defense*

NEW Diamond Nib

New Loc-Key-Set feature of BIG-HED Diamond Nibs permits micrometer control of diamond pass. Unique internal key construction absolutely prevents turning or shifting of diamond slug. Diamonds in sizes from ¼ to 10 karats. Orders shipped promptly. Billed subject to approval. When ordering, specify wheel dia. and grade.

BIG-HED Loc-Key-Set Diamond Nibs provide cooler dressing, permit closer tolerances. For best results we recommend 1 karat for each 7" dia. of wheel. Three grades of diamonds . . . Common, Medium and Select. Prices per karat: $12, $24 and $36. Contour template diamonds supplied only in Medium and Select grades. D.T.Co. Nibs are carried in stock. 24 hr. re-setting service. $1.00 Postpaid.

Call or write for details.

Pat. Pend.

DIAMOND TOOL CO., Not Inc.
938 E. 41st Street CHICAGO, ILL.

REGRIND TO LOWER COSTS

EMEMBE

ROTARY POWER CUTTERS
"Ground from the Solid after Hardening"

DESIGNED AND SERVICED BY
SEVERANCE TOOL COMPANY
1506 East Genesee Avenue SAGINAW, MICHIGAN

SEVERANCE

REGRIND TO SAVE TIME

THE KOCH TEST INDICATOR — the only Tool Makers' Indicator on the market with Two Working Ends for inside and outside tests. Compression and balance torsion give accuracy to a tool of high magnifying power. Scale of indicator reads .001" and has 11 lines divided into ⅛" space. Shock proof. Attachments of the indicator broaden its use and fit any gauge on the market with ⅜" spindle. Dealers Wanted.

Send for Bulletin T.

THE KOCH TEST INDICATOR
28 2nd Ave. Nyack, N. Y.

Tool Engineering Service Adds Reid Master Plates to Line

TOOL Engineering Service Co., Inc., Nutley, N. J., is now marketing a line of Reid Master Plates for use in laying out work, for inspection and assembly in precision aircraft, armament and gage work. These master plates are thoroughly normalized and weather seasoned, planed and scraped on the same three-point bearing on which they will rest in use and are guaranteed as to accuracy within .0003 on a 24"x36" size.

Heavy and closely spaced fins or webs outside the main underframe give rigid support to the edges, in addition to the heavy webbing within the main underframe, which has three-point support. These plates are available in standard sizes from 12"x18" to 36"x72". They may be had either planed or scraped.

Tool Engineering Service Co., Inc., 245-T Washington Ave., Nutley, N. J., will promptly mail literature and details on their Reid Master Plates at your request.

THE PRECISION UNIVERSAL TOOL HEAD brings all adjustments under absolute micrometric control without stopping tool or machine. In Jig Borer, Milling Machine or Boring Mill, it bores, faces, counterbores, turns outside diameters, mills flat surfaces and slots, undercuts, recesses, back faces and does an almost limitless range of "headache" jobs. Send for bulletins.

Removal Notice: We are no longer located at Bridgeport, Conn.
Send all communications, inquiries and orders to

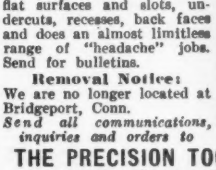
THE PRECISION TOOL COMPANY
P. O. Box 155, Brooklyn, New York
MAin 4-1064 Cable Address: "PRETOOL-NEWYORK"

Sandusky Foundry Wins Navy "E"

THE Sandusky Foundry and Machine Co., Sandusky, O., the second manufacturer in the State of Ohio to receive the honor award by the Bureau of Ord-

(Continued on next Page)

A NEW YEAR

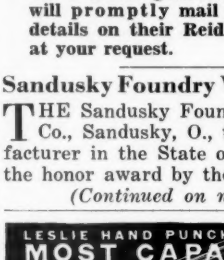


of satisfaction is in store for those men who are using Gerstner Chests for the first time.

Select yours from our Free Catalog.

GERSTNER TOOL CHESTS
56 Columbia St. Dayton, Ohio

LESLIE HAND PUNCH PRESS
MOST CAPACITY
POSITIVE ALIGNMENT



Max. cap. 2" dia. hole thru 10 ga. iron, proper shear on punch, throat depth 6". Takes punch press dies up to 3" x 4½" in area. Leaf arm gives perfect alignment without ways or leader pins. Portable.

Write for Catalog

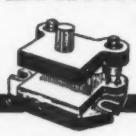
Ask your dealer or write direct.

LESLIE WELDING CO.
2941 Carroll Ave. Chicago

INTERCHANGEABLE BECAUSE
- Precision bored on master plates
- Precision assembled with cylinder squares

WRITE FOR CATALOG

DANNEMAN *Precision* DIE-SETS



F. C. DANNEMAN COMPANY 203 LAFAYETTE ST. NEW YORK, N. Y.

MARKING SPECIALISTS
CAN SHOW YOU THE
QUICK
WAY TO MARK DEFENSE PARTS WITH NUMBERING, LETTERING AND DESIGN.

MARKING MACHINES, NUMBERING MACHINES, STEEL LETTERS & FIGURES CARRIED IN STOCK OR MADE TO ORDER.

SEND YOUR MARKING PROBLEM AND ASK FOR CATALOG.

The AcromarK Corporation
261 North Broad St. Elizabeth, N. J.

nance of the Navy Department, of the Bureau of Ordnance Flag and "E" Pennant, is one of 30 other manufacturers in the United States who have received this award. For a comparatively small concern like Sandusky Foundry and Machine Co., with only 258 employees, to be singled out for this award is an unusual honor. However, the nature of the work in which the company is engaged is unusual. Highly specialized manufacturing processes are used in supplying the Navy with vital material, namely cast bronze sleeves for protecting the steel drive shafts against the action of salt water, for battleships, cruisers, destroyers and all types of vessels. The normal peacetime production has been stepped up over 300 percent to meet the National Emergency.

Kennicott Advances with McKenna

W. L. KENNICOTT, formerly Los Angeles Sales Manager of McKenna Metals Co., is now at the head office and factory at Latrobe, Pa., in the management of sales and engineering of Kennametal tools and their applications.

NEW
TAYLOR
"HI-DUTY"

Moderately Priced Model F-400 Production Drilling Machine. Capacity 1/32" to ½".

Many Outstanding Features.

Prompt Deliveries

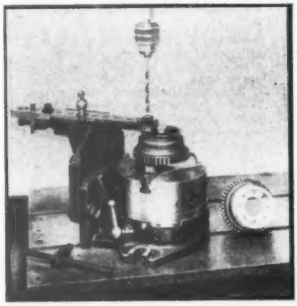
Investigate Today!

Taylor Manufacturing Co.
3056 W. Meinecke Ave., Milwaukee, Wis.

Each blade is a separate unit, has five separate applications for its radius, and carries the corresponding external and internal forms.

LUFKIN
SAGINAW, MICHIGAN • New York City

★ **THE HARTFORD SUPER-SPACER**



Insures Accuracy—The master index and set of six mask plates give instant, fool-proof accuracy—helping to speed up work, particularly where many setups are required.
Simple, rigid construction allows heavy cuts.

Ask for Circular TD-3

THE HARTFORD SPECIAL MACHINERY CO.
281 HOMESTEAD AVE. • HARTFORD CONN.

Advertisers Index

Ace Tool and Die Company..... 94
Acme Industrial Company..... 83
AcromarK Corporation, The..... 99
Ajax Steel & Forge Company.....102
Allegheny Ludlum Steel Corporation..... 15
Allen Manufacturing Company..... 81
Alofs Manufacturing Company 84
American Broach & Machine Company..
American Industrial Publishers.....
American Swiss File and Tool Co.....
Armstrong-Blum Mfg. Co.....Back Cover
Armstrong Bros. Tool Company..... 92
Atlas Press Company..... 10

Baker Brothers, Inc.....101
Barth Stamping & Machine Works..... 95
Bissett Steel Company..... 80
Black Drill Company.....
Blanchard Machine Company..... 16
Bokum Tool Company.....
Boyar-Schultz Corporation 23
Builders Iron Foundry..... 76
Bunell Machine & Tool Company.22 and 95
Busch Company, J. C..... 84

Carborundum Company, The..... 19
Cerro de Pasco Copper Corporation..... 18
Challenge Machinery Company .....
Chicago Rawhide Mfg. Company..... 64
Chicago Wheel and Mfg. Company..... 27
Cleveland Universal Jig Company..... 95
Colonial Bushings, Inc..... 92
Colonial Broach Co.....
Columbia Tool Steel Company..... 88
Conrad & Moser 94
Continental Machines, Inc..... 35
Cullen-Friestedt Company 40
Cullman Wheel Company.....102

Danly Machine Specialties, Inc..... 20
Danneman Company, F. C..... 98
Darwin & Milner, Inc.....
Davis Tool & Engineering Company..... 94
Dayton Rogers Mfg. Company..... 44
Delta Manufacturing Company..... 96
Denning Manufacturing Company..... 93
Despatch Oven Company..... 56
Detroit Stamping Company..... 63
Diamond Tool Company 97
Die Supply Company..... 42
DoAll Co., Inc., The..... 39
Douglas Machinery Company..... 59
Dreis and Krump Mfg. Company..... 94
Dresel-Betz Company 94
Drive-All Manufacturing Co...Center Spread
Dumore Company, The..... 17
Duro Metal Products Company..... 12
Dykem Company .....

Enterprise Machine Parts Corp.....79 and 94
Esco Engineering Corp.....
Ex-Cell-O Corporation 11
Experimental Tool & Die Company..... 61

Federal Tool Corp. .....49 and 54
Firth-Sterling Steel Company..... 51
Ford Motor Co., Johansson Div.....
Forging and Casting Corporation, The...
.....Inside Front Cover

Gairing Tool Company, The.....
Gallmeyer & Livingston Company..... 96
General Die & Tool Co..... 95
Gerstner and Sons, H..... 98
Gorton Machine Company, George..... 37

Hahn Manufacturing Company..... 95
Hamilton Tool Company.....86, 93 and 96
Hammond Machinery Builders, Inc..... 58
Hardinge Brothers, Inc..... 3
Hartford Special Machinery Co....94 and 99
Holo-Krome Screw Corp..... 5
Hovis Screwlock Company..... 24

Illinois Tool Works.....
Industrial Machine Company, The 95

Jackson Machine & Tool Co.....69 and 87
Jefferson Machine Tool Company..71 and 90
Jessop Steel Company..... 25
Johnson Gas Appliance Company .....

Kearney & Trecker Corporation..... 28
Kiffer Tool & Die Co..... 95
Knu-Vise, Inc. .....
Koch Test Indicator, The..... 98
Koebel Diamond Tool Co.....
Koestlin Tool & Die Corp.....26 and 94

Lakeside Steel Improvement Company.... 93
Leslie Welding Company..... 98
Linderme Machine and Tool Company... 92
Lufkin Rule Company..... 99
Lydon Brothers .....

M-B Products 89
Majestic Tool & Mfg. Company...77 and 94
Marburg Bros., Inc. 68
Masonite Corporation 21
McKenna Metals Company.....
McKinney Tool & Manufacturing Co..... 95
Michigan Chrome and Chemical Company 86
Monarch Machine Tool Company, The... 9
Muehlhausen Spring Corp.....

Noble & Stanton..... 95
Norton Company 8

Ohio Tool Company.....6, 7 and 95
Oliver Instrument Company..... 79
O'Neil-Irwin Mfg. Company..... 97

Paramount Tool Company..... 95
Peerless Machine Company..... 13
Phoenix Machine Company..... 95
Precision Tool Company, The..... 98
Producto Machine Company, The 85
Putnam Tool Company.....Front Cover

Racine Tool and Machine Company..... 57
Rane Tool Co., Inc. 94
Robbins Engineering Company..... 94
Royal Oak Tool & Die Machine Company 94

Scherr Co., Inc., George..... 55
Schraner, A. P., & Company..... 95
Severance Tool Company..... 97
Sheldon Machine Company, Inc..... 91
Shore Instrument & Mfg. Co., Inc..... 90
Smith Power Transmission Co., The..... 89
Sommer & Adams Co. .....
.....Inside Back Cover and 95
South Bend Lathe Works..... 14
Standard Pressed Steel Company..... 82
Star Machine & Tool Company....78 and 95
Starrett Company, L. S..... 43
Strong, Carlisle & Hammond Co.....

Tannewitz Works, The..... 88
Taylor Mfg. Company..... 99
Timken Roller Bearing Company..... 54
Tomkins-Johnson Company 75
Tools & Gages, Inc.....96 and 101
Tool Engineering Service Co., Inc., ... 78
Tungsten Electric Corp. 41

Universal Engineering Company..... 73

Variety Machine & Stamping Company.. 96
Viking Tool & Machine Corp.....65 and 94

Walls Sales Corporation..... 93
Walton Company 91
Webber Gage Company.....
Weich Industries, Inc..... 62
Western Manufacturing Company..... 50
Wheelock, Lovejoy & Company.....
Willey's Carbide Tool Company..... 91
Wittek Manufacturing Company..... 60

Yohe Supply Co., Wm. S.....

BAKER Model No. 1 Reversing Electric Type KEYSEATER

Standard equipment includes flat centering plate, centering bushings, V-centering plate, cutters and cutter bars. Special equipment for cutting taper keyseats is available.

This electric reversing type Keyseater operates on the draw cut principle—cutting tools (except for very small holes) being held rigidly and accurately in a reciprocating or cutter bar. Keyseats are cut quickly and at an accuracy that insures alignment.

Only the Baker No. 1 Keyseater has all the following advantages:

(a) Upper end of cutter bar slides in full bearing above the work.
(b) Cutter bar is carried in ram actuated by rack and pinion—giving constant speed to cutter.
(c) Work is fed to the cutter—travel of cutter bar is always maintained in one fixed true path.
(d) Two position column for big work.
(e) Table 21" x 21½" with 4 T slots, well ribbed and accurately aligned to cutter bar.
(f) Ample capacity to cut keyways in mild steel 12" long x 1½" wide at feed of .005".

Write for new illustrated circular T-1002.

BAKER BROS., INC.
Toledo Ohio

We have always Specialized in the Design and Building of

Precision Gages and Dies

Fine Gage and Die Makers

Our organization has been trained for years in the exacting art of fine gage and die making.

Our facilities are among the best. Some of the largest users of precision gages, gaging fixtures and stamping dies have been our regular customers year after year.

We are again expanding our capacity to give the same standard of service to a larger number of companies, particularly those engaged in National Defense work.

TOOLS & GAGES, INC.
3112 E. 63rd St. Cleveland, Ohio

May we quote on your requirements?

Send for Valuable Booklet

Forgings For All Industries

Rough Turned or Finished Complete

•

Composite Die Sections
Extrusion Tools
Crankshaft Forgings
Gear Forgings
Die Casting Dies

•

Rings, Discs, Blocks, Shafts, Hubs, Bars, and Special Shapes.
Tool Steel of all Makes

S.A.E. Specifications

STAINLESS & COPPER FORGINGS

May We Serve You?

AJAX STEEL AND FORGE Co.

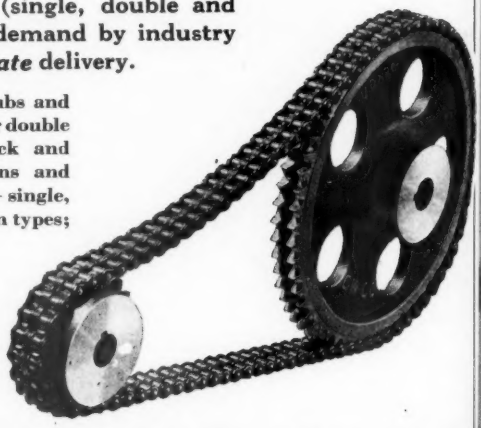
205 ADAIR STREET **DETROIT, MICHIGAN**

CULLMAN Block and Roller SPROCKETS

A large stock of steel disc and hub sprockets for roller chains (single, double and triple) in all sizes in demand by industry is available for *immediate* delivery.

We also stock or supply: Hubs and Flexible Couplings for single or double roller chains; Diamond Block and Roller Chains; Silent Chains and Couplings; Speed Reducers — single, double and quadruple reduction types; Machine Tool Drives.

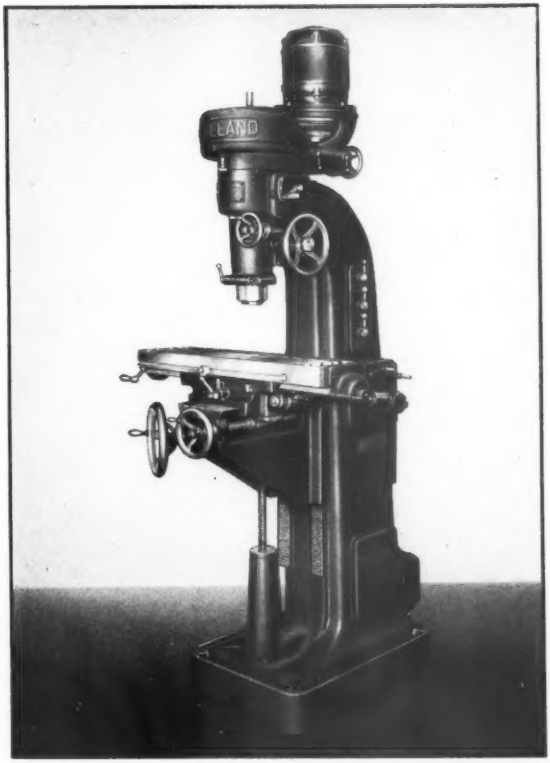
Write for a copy of our very complete Catalog No. 21.



CULLMAN WHEEL COMPANY **1332 Altgeld St. Chicago, Ill.**

The Cleveland No. 1

VERTICAL MILLING MACHINE



A standard high-speed Vertical Spindle Milling Machine designed to meet the most exacting requirements; built to give the highest standard of performance.

Specifications and full information on request

THE SOMMER & ADAMS COMPANY

18511 Euclid Avenue **Cleveland, Ohio**

High Speed Cutting-off in the stockroom ends delays and profitless handling

In modern plants everywhere, just as in this large electrical manufacturing plant, it has become part of efficient plant operation to install one or more MARVEL No. 6A or No. 9A High Speed Production Saws right at the stock racks, to end material "bottle necks" and unnecessary materials handling.

With one of these versatile heavy-duty all ball-bearing saws (the fastest cutting-off machines built), the stockroom can provide single pieces or quantities of identical pieces, cut off from bars and tubing on a moment's notice. With no more operator attention than is required by an automatic screw machine, these saws will automatically measure, feed and cut off identical lengths, slices or pieces from single or nested bars. Quantity runs can be interrupted at any point for a miscellaneous cut by simply disengaging the automatic bar push-up.

Buy from your local distributor

ARMSTRONG-BLUM MFG. CO. *"The Hack Saw People"*
5700 Bloomingdale Ave., Chicago, U. S. A. Eastern Sales: 225 Lafayette St., N. Y.